DOCUMENT RESUME

ED 364 732 CE 065 283

AUTHOR Muraskin, Lana D., Comp.
TITLE Secondary Vocational Education: Availability, Coursetaking, and Outcomes.
INSTITUTION Westat, Inc., Rockville, MD.
SPONS AGENCY Department of Education, Washington, DC. Office of the Under Secretary.
REPORT NO ED/OPP-93-36
PUB DATE 93
NOTE 156p.
PUB TYPE Reports - Research/Technical (143) -- Statistical Data (110)

EDRS PRICE MF01/PC07 Plus Postage.
DESCRIPTORS Academic Education; *Access to Education; *Course Selection (Students); Decision Making; Educational Supply; *Education Work Relationship; *Employment Patterns; High Schools; *Mathematics Achievement; Outcomes of Education; Relevance (Education); School Location; *Vocational Education; Work Experience

ABSTRACT

This volume presents information on secondary vocational education compiled by the recently completed National Assessment of Vocational Education. Chapter 1 provides information about regional, district, and school-level availability of vocational education and the institutions that provide it. It reports the following: availability differs by region, size, and urbanicity of district and among different types of institutions; instructional options are most available in larger districts and in districts located in suburban areas; and students with access to area schools probably have a greater opportunity to enroll in occupationally specific courses. Chapter 2 is an extended exploration of coursetaking patterns in academic and vocational education from the high school classes of 1969-1987. The following trends are noted: a gradual and then steep increase in total credits throughout the period, a decline in academic and an increase in vocational coursetaking in the 1970s, and a resurgence of academic coursetaking in the 1980s accompanied by a slight decline in vocational coursetaking. Chapter 3 examines two sets of outcomes of vocational education--mathematics achievement and early labor market experience. Findings show the following: mathematics enrollments increased dramatically, mathematics skills can be learned outside of traditional mathematics courses, and about 38 percent of all occupationally specific vocational courses were used in skilled jobs 1 month after graduation. Contains 71 tables and 13 references. (YLB)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED 364 732

SECONDARY VOCATIONAL EDUCATION: Availability, Coursetaking, and Outcomes

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

☑ This document has been reproduced as received from the person or organization originating it.

☐ Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

Prepared Under Contract by:

Westat, Inc.
Rockville, MD

ED 350 232

BEST COPY AVAILABLE

The views expressed in this report, developed under contract to the U.S. Department of Education, do not necessarily reflect the position or policy of the Department, and no official endorsement by the Department should be inferred.

BEST COPY AVAILABLE

SECONDARY VOCATIONAL EDUCATION:
Availability, Coursetaking, and Outcomes

Compiled by
Lana D. Muraskin

1993

Prepared Under Contract by:

Westat, Inc.
Rockville, MD

CONTENTS

EXECUTIVE SUMMARY i

INTRODUCTION v

Chapter 1: The Delivery System for Secondary Vocational Education 1

Regional Differences in Availability of Secondary Vocational Education 1
Vocational Education at the District Level 3

Availability of Vocational Education 3
Mix of Offerings 7
The Goals of Vocational Education 9
Recent Changes in Vocational Enrollments at Area Schools 11
Changes in District Graduation Requirements 12
Recent Program and Policy Changes in Vocational Education 13

Vocational Education at the School Level 17

Student Composition and Access to Vocational Education (HS&B--Class of 1982) 19
Area Schools, Regular Schools, and the Delivery of Vocational Education (HSTS--Class of 1987) 22

Summary 24

Chapter 2: Patterns of Vocational and Academic High School Coursetaking 26

Overall Trends in Academic and Vocational Coursetaking 27
Detailed Examination of Academic and Vocational Coursetaking 32

Changes in Coursetaking: Academic Subject Areas 32
Changes in Coursetaking: Vocational Subject Areas 38

Coursetaking Patterns of Student Subgroups 49

Gender and Coursetaking Patterns 49
Race/Ethnicity and Coursetaking Patterns 68
High School Achievement and Coursetaking Patterns 78
Coursetaking Patterns and Future Plans 82
Coursetaking and Mothers' Education 91

Summary and Implications of Trends in Coursetaking 91

Chapter 3: Outcomes of Secondary Vocational Education 97

Effects of Vocational Education on Learning Mathematics 97

Background 97
Applied Learning of Mathematics 101
Policy Implications 105

Effects of Occupationally Specific Training on Early Work 106

Sources of Data 108
Findings on Course Utilization 109
The Causes of Course Underutilization 113

LIST OF TABLES

Table 1-1	Regional Differences in Average Vocational Credits Earned by Public High School Graduates, 1975-1987	2
Table 1-2	National Estimates of Number and Type of High Schools and Districts Offering Vocational Programs, 1988	4
Table 1-3	District Enrollments in Districts that Do and Do Not Send Students to an Area Vocational School (AVS), 1988	5
Table 1-4	Location of School District and Access to Area Vocational School, 1988	6
Table 1-5	Percentages of Students Taking Occupationally Specific Courses, by Number of Credits Earned and School Location High School Class of 1982	7
Table 1-6	National Estimates of Vocational Course Offerings in Regular School Districts and Secondary Area Vocational School (AVS) Districts, 1988	8
Table 1-7	National Estimates of Goals of Vocational Education Administrators in Regular School Districts and Secondary Area Vocational School (AVS) Districts, 1988	10
Table 1-8	Changes in Student Enrollment in Regular and AVS Districts, 1982-83 to 1986-87	12
Table 1-9	National Estimates of Core Graduation Requirements in Regular School Districts, 1982-83 and 1986-87	14
Table 1-10	Percentage of Regular Districts Requiring Vocational Credits for Graduation and Number of Credits Required, 1982-83 and 1986-87	15
Table 1-11	Changes Over the Last Five Years in Course Content, Supplemental Services and Other Program Activities in School Districts	16
Table 1-12	Changes Over the Last Five Years in Course Content, Supplemental Services and Other Program Activities in Secondary Area Vocational Schools	18
Table 1-13	Estimated Quality of Vocational Education by School Level Concentration of Disadvantaged Students	21
Table 1-14	Location of High School Graduates Vocational Courses, as a Percentage of all Credits Earned in Vocational Education, Class of 1987	23
Table 1-15	Profile of Vocational Education in Area Vocational Schools and All Schools Based on Credits Earned in Vocational Subjects Class of 1987	25

Table 2-1	Average Number of Credits Completed by Public High School Graduates, 1969-1987	28
Table 2-2	Average Credits Earned by Grade Level for High School Graduates, 1969-1987	30
Table 2-3	Average Number of Credits Earned by Public High School Graduates in Academic Subjects, 1969 to 1987	33
Table 2-4	Percentage of High School Graduates with Credits Earned in Certain Mathematics Courses, 1969-1987	34
Table 2-5	Percentage of High School Graduates with Credits Earned in Science Courses, 1969-1987	35
Table 2-6	Percentage of High School Graduates with Credits Earned in English Courses, 1969-1987	36
Table 2-7	Percentage of High School Graduates with Credits Earned in Social Studies Courses, 1969-1987	37
Table 2-8	Percentage of High School Graduates with Credits Earned in Foreign Language and Fine Arts, 1969-1987	38
Table 2-9	Average Total Credits Completed by High School Graduates in Vocational Education and Average Credits by Vocational Sub-Curriculum, 1969-1987	40
Table 2-10	Average Credits Completed by All Students in General Labor Market Preparation (GLMP), 1969-1987	40
Table 2-11	Participation in the Consumer and Homemaking Education (C&HE) Curriculum, 1969-87	41
Table 2-12	Average Number of Credits Completed in Specific Labor Market Preparation Subjects, 1969-1987	43
Table 2-13	Percentage of Graduates Participating in the Specific Labor Market Preparation (SLMP) Curriculum by Level of Coursework, 1969-1987	44
Table 2-14	Average Credits Completed in the SLMP Curriculum by Level of Coursework, 1969-1987	45
Table 2-15	Average Credits Completed in the SLMP Curriculum by Level of Coursework and Grade Level, 1969-1987	47
Table 2-16	Percentage of Graduates Completing a Given Number of Credits in "Primary Vocational Fields", 1969 to 1987	48
Table 2-17	Average Total of Credits Completed by Male and Female High School Graduates, 1969-1987	50

Table 2-18 Average Number of Academic Credits Earned by Male and Female Public High School Graduates, 1969-1987 51

Table 2-19 Average Number of Credits Earned by Male and Female Public High School Students in Math and Science, 1969-1987 52

Table 2-20 Average Math and Science Credits Earned by All Students, Males, and Females, 1969-1987 53

Table 2-21 Average Number of Credits Earned by Male and Female Public High School Graduates in Math Subjects, 1969-1987 54

Table 2-22 Science Credits Earned by Male and Female High School Graduates, 1969-1987 55

Table 2-23 Social Studies and English Credits Earned by Male and Female High School Graduates, 1969-1987 56

Table 2-24 English and Social Studies Sub-Curricula Credits Earned by Male and Female High School Graduates, 1969-1987 57

Table 2-25 Fine Arts and Foreign Language Credits Earned by Male and Female High School Graduates, 1969-1987 59

Table 2-26 Average Number of Credits Earned by Male and Female High School Graduates in Foreign Languages, 1969 to 1987 60

Table 2-27 Average Number of Vocational Education Credits Earned by Male and Female High School Graduates: Total, C&HE, GLMP Subjects, and SLMP, 1969-1987 62

Table 2-28 Average Number of Credits Earned by Male and Female High School Graduates in Different SLMP Subjects (1969-1987) 64

Table 2-29 Percentage of Male and Female High School Graduates Who Enrolled in Agriculture, Construction, Precision Production, and Mechanics and Repairs Courses, 1969-1987 66

Table 2-30 Percentage of Male and Female High School Graduates Who Enrolled in Business Management, Business Support, Occupational Home Economics, Health, and Technical/Communications Courses, High School Classes of 1969-1987 67

Table 2-31 Total Credits Earned by High School Graduates by Race/Ethnicity, 1969-1987 69

Table 2-32 Academic, Vocational, and Personal/Other Credits Earned by High School Graduates by Race/Ethnicity, 1969-1987 70

Table 2-33	Academic Coursetaking of High School Graduates for Ethnic/Racial Groups, Credits Earned by Subject Area, 1969-1987	72
Table 2-34	Total Vocational and Subcurriculum Vocational Participation of High School Graduates by Race/Ethnicity, 1969-1987	74
Table 2-35	Average Credits Completed in the GLMP Curriculum by High School Graduates, by Race/Ethnicity, 1969-1987	76
Table 2-36	Total Credits Earned by High School Graduates by High School Grade Point Average (GPA), 1969-1987	79
Table 2-37	High School Academic Credits for High School Graduates by GPA, 1969-1987	80
Table 2-38	Vocational Credits by Student GPA: High School Classes of 1969-1987	81
Table 2-39	C&HE, GLMP, and SLMP Credits Earned by Students Taking Any Vocational Courses by GPA, 1969-1987	83
Table 2-40	Post High School Plans of High School Graduates, 1969-1987	85
Table 2-41	Total Credits Completed and Percentage of Students Participating in the Various High School Curricula, by Year of Graduation and Plans After High School, 1969-1987	86
Table 2-42	Average Number of Credits Completed in Academic Subjects, by Plans After High School and Year of Graduation, 1969-1987	88
Table 2-43	Total Credits Completed and Percentage of Students Participating in the Various Vocational Curricula, by Plans After High School and Year of Graduation, 1969-1987	90
Table 2-44	Total Credits Earned by High School Graduates by Mother's Education, 1969-1987	92
Table 2-45	Academic Credits Earned by High School Graduates by Mother's Education, 1969-1987	92
Table 2-46	Vocational Credits Earned by High School Graduates by Mother's Education, 1969-1987	93
Table 3-1	Average Math Test Scores by Math Enrollment and by Educational Attainment, High School Class of 1982	99
Table 3-2	Average Course Enrollments in Grades 11 and 12 for Graduates of the Class of 1982	100
Table 3-3	Estimates of the Contribution of Traditional Math and Applied Math Courses to Growth in Mathematics Proficiency	103

Table 3-4 Example Occupations by Skill Level 109

Table 3-5 Rates of Vocational Course Utilization 110

Table 3-6 Rates of Vocational Course Utilization by Subject Area, Women 111

Table 3-7 Rates of Vocational Course Utilization by Subject Area, Men 113

Table 3-8 The Incidence of Low, Medium, and High Skill Occupations 115

Table 3-9 The Distribution of Jobs by Occupational Area and Skill Level, Women 116

Table 3-10 The Distribution of Jobs by Occupational Area and Skill Level, Men 117

EXECUTIVE SUMMARY

Introduction

This volume presents information on secondary vocational education compiled by the National Assessment of Vocational Education (NAVE), authorized by the Carl D. Perkins Act of 1984. The NAVE presented its report to Congress in June, 1989. At that time, it issued a summary report and three additional volumes.

When the NAVE ended, there was no single document which compiled the analyses conducted on the status of secondary vocational education. Much of the information and policy implications was presented in the NAVE summary report and the volume on special populations. The rest was available from contractor reports. This report seeks to present the NAVE analyses on secondary vocational education information in a unified document. This volume presents a great deal of information about policy and practice, but does not provide a set of conclusions and recommendations. The recommendations based on the information reported here were included in the NAVE Summary of Findings and Recommendations published in July 1989.

The document is divided into three main chapters. The first presents information about regional, district, and school-level availability of vocational education and the institutions that provide it. The second chapter is an extended exploration of coursetaking patterns in academic and vocational education from the high school class of 1969 to the high school class of 1987. The third chapter examines two sets of outcomes of vocational education--mathematics achievement and early labor market experience.

The Delivery System for Secondary Vocational Education

The availability of vocational education differs by region, size and urbanicity of district, and among different types of institutions. Instructional options (such as specialized facilities) are most available in larger districts and in districts located in suburban areas. While almost all students have some opportunity to enroll in vocational education in their regular high school, those with access to area schools probably have a greater opportunity to enroll in occupationally specific courses in areas such as trades, and industries and health.

- In 1987, vocational education was a more prominent part of the high school curriculum in the North Central and Southeastern portions of the United States than in other regions. Graduates in the North Central region took about 30 percent more vocational education than students in the Northeast.

- Most regular school districts (81 percent) offer vocational education in comprehensive high schools exclusively, but a considerable number also offer students the opportunity to attend vocational programs outside the district. In 1987, 61 percent of districts, generally those with larger median enrollments, provided students with the opportunity to attend areas vocational schools that are not part of the home district.

- Area vocational schools are widely considered to provide greater depth of vocational offerings, but opportunities for attending area vocation schools differ by location. Looking solely at regular school districts without separate vocational high schools in 1987, 74 percent of such districts in suburban areas offered students the option to attend area vocation schools. This is in contrast to 59 percent of such districts in urban areas and only 42 percent of rural districts. In general, very small school districts and rural school districts appear to offer fewer opportunities for their students to attend area vocational schools.

- The lack of opportunities to attend area schools in rural areas is unfortunate because it appears that students in rural areas take more occupationally-specific vocational education than students in either urban or suburban areas. In addition, rural students from the class of 1982 were more likely to take three or more units in a single occupationally specific field than students in suburban and urban areas.

- Although all districts offer vocational education, this does not imply that all students have comparable access to vocational programs. In 1982, students who graduated from public high schools with the greatest concentrations of disadvantaged students (based on average student achievement, family income, and socioeconomic status) had the fewest opportunities to attend area vocational schools and enroll in cooperative education or work-study. They had the fewest vocational program areas from which to choose, and the least depth (i.e., the smallest number of different courses) in the programs offered.

Patterns of Vocational and Academic High School Coursetaking

The overall trend in coursetaking is a gradual and then steep increase in total credits throughout the period, a decline in academic and an increase in vocational coursetaking in the 1970s, and a resurgence of academic coursetaking in the 1980s accompanied by a slight decline in vocational coursetaking.

- Despite the small decline in overall vocational enrollment in the 1980's, there was almost no decline in average credits in specific labor market preparation (SLMP) courses. The percentage of all high school students taking at least one course in SLMP increased over the entire period from 72 percent of students in the class of 1969 to 89 percent for the class of 1987. Fields with increased enrollment include health, occupational home economics, and technical/communications education.

- Differences in academic and vocational coursetaking patterns between high and low achieving students widened slightly in the 1980s. In the class of 1969, "below C" students took 12.74 academic credits or 71 percent of that taken by "mostly A" students. Between the classes of 1982 and 1987, "mostly A" students increased their academic coursetaking substantially--by 3 credits on average. By the class of 1987, "below C" students took only 68 percent of the academic credits of their "mostly A" classmates. Most of the additional academic coursetaking by higher achieving students was the result of increases in total credits, not decreases in vocational credits.

- About a third of students graduating in the late 1970s and early 1980s planned to work full time after high school. By the class of 1987, however, only one sixth of students planned to work full time after high school. Students planning to work full time after high school took fewer total credits and more vocational credits than those expecting to attend four-year colleges. In the class of 1987, the typical work-bound student took 6.3 vocational credits or about twice the amount of vocational education taken by students planning to attend four-year institutions.

These findings raise the question of whether there is a minimum level of academic instruction that all students should obtain, and whether the current degree of disparity in academic instruction is desirable or reasonable. It is impossible to know the extent to which performance is linked to choice of courses, but the clear implication of the data is that the educational system is exposing high- and low-achieving students to different high school curricula, and that the differences continue despite reform.

Outcomes of Secondary Vocational Education

Recently, a great deal of interest among educators has focused on new ways of integrating mathematics and other core academic subjects with vocational education. Greater enrollment in "applied" courses could substantially increase the academic learning of high school students, particularly those who shy away from traditional math and science courses.

- Mathematics enrollments increased dramatically between the high school class of 1982 and 1987. However, more than one-fourth of students continued to take two or fewer years of mathematics, that is, no mathematics at the 11th and 12th grade levels.

- Although enrollment in conventional mathematics courses is related to the greatest gains in math skills, there is some evidence that mathematics skills can be learned outside of traditional mathematics courses. For college-bound students, participation in a specific vocational math course, such as business math, increased mathematics proficiency by 1.7 points on the HS&B mathematics test, which is equivalent to the contribution of Algebra II. Among noncollege-bound youth, who typically take fewer math courses, enrollment in math-related vocational education, such as bookkeeping or electronics, was related to an increase in mathematics proficiency of 0.63 points.

There are several possible advantages of developing integrated applied courses. It may be more effective to teach core skills in an applied context. An integrated course combining drafting and geometry, for example, might produce greater educational gains than separate courses in drafting and geometry. Students may be more willing to enroll in integrated or applied courses than in stand-alone, traditional core courses. Given that large numbers of high school students continue to receive limited amounts of mathematics instruction despite the reforms of the last decade, it seems prudent to consider alternatives to increase exposure to mathematics.

NAVE developed new measures of vocational skill utilization--the course utilization rate and the skilled jobs course utilization rate. The course utilization rate (CUR) measures the share of all vocational courses taken by students that are related to jobs they eventually obtain. The skilled jobs course utilization rate (skilled jobs CUR) measures the share of all vocational courses that are related to the jobs that the students obtain only when those jobs require more than minimal skills.

- For graduates of the class of 1982 who did not continue their education, about 38 percent of all occupationally specific vocational courses were used in skilled jobs one year (approximately 16 months) after graduation. By three years after graduation, the skilled jobs CUR had increased to 44 percent. Thus over time, more students obtained jobs that were related to vocational skills learned in high school.

- At both points in time, rates of skilled jobs course utilization were substantially higher for women than for men--46 versus 33 percent one year after graduation and 53 versus 38 percent three years after graduation. The higher skilled jobs CUR for women was due, in large part to the extensive enrollment of women in business education (56 percent of occupationally-specific training) and the relatively high rate at which business graduates obtained skilled, business-related jobs--53 percent one year after graduation and 65 percent three years after graduation.

- Voluntary and frictional nonplacement were major causes of course underutilization, particularly among men. Students either chose to work in occupations unrelated to their specific occupational training or they accepted work in unrelated occupations because they were unable to find available training-related jobs.

- Employment in low-skill jobs were a major reason for course underutilization one year after graduation, but a relatively modest reason three years after graduation.

- Enrollment in unrelated vocational courses (nonconcentration) was an important source of course underutilization in subsequent jobs, particularly for men (23 percent one year after graduation).

In summary, the evidence indicates that in order for occupationally-specific training to remain viable at the secondary level, much greater emphasis needs to be given to placing students in training-related jobs. The range of curriculum options in secondary vocational education needs to be expanded to accommodate both students who are and are not ready to select a specific area of occupational specialization. To do so, vocational education will need new courses and programs that provide instruction in broad occupational skills that cut across a wide array of occupations. This objective may be particularly important for training in occupations that account for only modest shares of employment. This objective is also important because the findings presented here on the underutilization of training are only for those students who obtained no further education beyond high school. In fact, the majority of secondary vocational education is taken by students who enroll in some form of postsecondary education. Finally, secondary vocational education must recognize that high school students need a firm grounding in both academic and occupational skills.

INTRODUCTION

This volume presents information on secondary vocational education compiled by the recently completed National Assessment of Vocational Education (NAVE). The NAVE presented its report to Congress in June, 1989. At that time, it issued a summary report and three additional volumes.

When the NAVE ended, there was no single place in which the information it generated on the status of secondary vocational education was presented. Some of that information was presented in the NAVE summary report and the volume on special populations. Most of the rest was available from contractor reports. A specific volume on secondary vocational education participation and outcomes was never issued. This report seeks to present a great deal of that information in a unified document.

This volume differs from the previous NAVE volumes. Like the others, it presents a great deal of information about policy and practice, but unlike the others it does not provide a set of conclusions and recommendations. The main reason is that the time for recommendations is long past. The primary reason to issue this report is to make available a wide range of information to policymakers, practitioners, and researchers who have requested it. It is hoped that the information is of value to them.

The document is divided into three main chapters. The first presents information about regional, district, and school-level availability of vocational education and the institutions that provide it. The second chapter is an extended exploration of coursetaking patterns in academic and vocational education from the high school class of 1969 to the high school class of 1987. The third chapter examines two sets of outcomes of vocational education--mathematics achievement and early labor market experience.

This document was compiled by Lana Muraskin, a NAVE staff member, but it reflects the work of a large number of individuals and organizations. The main contributors to this volume (and their affiliations during the NAVE) are:

> Chapter I--Janet Swartz and Mary Ann Millsap, Abt Associates; Becky Hayward, Policy Studies Associates; Larry Hodgkiss, Decision Resources; John Wirt, NAVE
>
> Chapter II--John Tuma, Cynthia Brown, Antoinette Gifford, Laura Horn, E. Gareth Hoachlander, MPR Associates; Robert Meyer, NAVE
>
> Chapter III--Robert Meyer, NAVE; Robin Horn, Decision Resources; Robert Meyer wrote this chapter in the present volume.

Dr. Muraskin has written Chapters I and II, and edited Chapter III. She hopes that she has done justice to the many organizations and individuals that carried out this research over several years.

Dr. Muraskin would like to thank all those who helped her in ferreting out the information for this volume. In particular, Philip Kaufman of MPR Associates responded unfailingly to requests to provide additional data for Chapter II. The volume was reviewed, and useful comments and corrections supplied, by Janet Swartz, Mary Ann Millsap, John Wirt, David Boesel, and John Tuma.

Chapter 1

The Delivery System for Secondary Vocational Education

This chapter will describe the delivery system for secondary vocational education along a number of dimensions. First, it will examine the regional distribution of vocational education across the nation. Next, it will describe the kinds of local education agencies that offer vocational education. The final part of this section will outline the mix of vocational education courses at educational institutions with different sets of characteristics. The section draws on the results of several different NAVE studies--analyses of student coursetaking patterns from high school transcript records, school-level data on the schools attended by the high school class of 1982, and a national survey of school districts that asked about vocational practices and policies. All data presented are for public secondary institutions and their enrollees.

REGIONAL DIFFERENCES IN AVAILABILITY OF SECONDARY VOCATIONAL EDUCATION

There is a sizeable amount of inter-regional variation in the availability of secondary vocational education. Based on a nationally representative sample of high school students' transcripts from the Class of 1987, vocational education was a considerably more prominent part of the high school curriculum in the North Central and Southeastern portions of the U.S. than in the Northeast or Western regions (Table 1-1). The greatest inter-regional differences were found between graduates in the North Central and Northeast regions. Graduates in the North Central region took about 30 percent more vocational education than students in the Northeast. Using Carnegie Units as a metric (a year of enrollment in a course is equal to one Carnegie Unit), students in the North Central region took an average of 4.75 credits in vocational education over four years of high school, as compared to 3.65 credits on average in the Northeast. As a result, vocational education constituted 20.9 percent

of the typical high school program in the North Central region but only 15.7 percent of a typical high school program in the Northeast region.

Table 1-1

Regional Differences in Average Vocational Credits
Earned by Public High School Graduates, 1975-1987

Region	Classes of 1975-78	Classes of 1979-82	Class of 1982	Class of 1987	
				Credits	Vocational as Percentage of All Credits
Northeast	4.19	4.33	4.30	3.65	15.7
North Central	4.90	5.24	4.99	4.75	20.9
Southeast	4.18	4.53	4.71	4.36	19.4
West	4.73	5.54	4.39	3.86	16.6

Source: MPR Associates. Unpublished data.

The inter-regional differences in vocational participation have changed over time. In the mid 1970s, students in the Northeast and Western regions took more vocational education than they took subsequently, and the gap between the regions was not as great. Averaging the course credits earned by the graduating classes of 1975-78, students in the West took an average of 4.73 vocational credits, compared with 4.90 in the North Central region. Students in other parts of the country took less vocational education--an average of 4.19 units in the Northeast and 4.18 units in the South. By the late 1970s, vocational participation had increased in all regions, and the West led the rest of the country in vocational participation. Averaging the credits earned by the high school classes of 1979-1982, students in the West took 5.54 vocational credits and those in the North Central took 5.24.

During the 1980s, vocational participation fell substantially in the West, while in the rest of the country it fell slightly. This change accounts for the greater inter-regional differences for the class of 1987 than for earlier classes.

VOCATIONAL EDUCATION AT THE DISTRICT LEVEL

To describe the mix of settings in which secondary vocational education is offered, the NAVE surveyed a nationally representative sample of 1,500 local education agencies (school districts), oversampling separate administrative agencies providing vocational education through area vocational schools exclusively (called AVS districts).[1] Respondents were the individuals primarily responsible for administering vocational education in each district polled.[2] The survey was conducted for NAVE by Janet Swartz and Mary Ann Millsap at Abt Associates.

Availability of Vocational Education

Most regular school districts offer vocational education in comprehensive high schools exclusively, but a considerable number also offer students the opportunity to attend vocational

---

[1] The survey of districts was conducted by Janet Swartz and Mary Ann Millsap and the results reported in Janet Swartz, *State and Local Response to the Carl D. Perkins Act, Survey Analysis Final Report*, (Cambridge MA: Abt Associates) January, 1989. Using a stratified, two-stage cluster sampling design, 18 states were surveyed, the seven largest states were included with certainty and the other states were drawn based on four stratification variables--region, per pupil education expenditures, percent of students in postsecondary education and changes in high school graduation requirements in the five years prior to the survey. In the second stage of sampling, institutions and districts were selected from within these states. To add to the survey's usefulness, Census information for each district was merged with questionnaire data. The survey was conducted in the Spring of 1988.

[2] Including a telephone followup to obtain key questionnaire items from nonrespondents, the response rate for regular school districts was 76.7 percent (n=848) and 78.7 percent for area vocational school districts (n=282). Districts were weighted based on their probability of selection at either stage in the selection process and were adjusted for non-response. Final weighted sample sizes were 11,552 for regular districts, and 881 for separate AVS districts. Analysis of nonresponse bias revealed few differences between responding and nonresponding districts--although non-responding districts were more likely to be rural and have somewhat fewer minority students.

programs outside the district. Overall, 81 percent of districts with any vocational education offer vocational education in a single comprehensive high school (Table 1-2). The vast majority of districts (77 percent) do not have specialized vocational high schools. Nonetheless, 61 percent of districts, enrolling about 63 percent of the nation's students, provide students with the opportunity to attend area vocational schools that are not a part of the home district. While districts that do and do not offer this option do not differ by average enrollment size, the median enrollment size in school districts that do not provide access to area vocational schools is less than half that of districts that send students to area schools (220 vs 425 students in grades 9-12--Table 1-3). It would appear, then, that district enrollment size probably affects area school access, with the smallest districts offering the least access.

Table 1-2

National Estimates of Number and Type of High Schools and Districts Offering Vocational Programs, 1988[a/]

Type of School	Percentage of Districts with Schools Offering Vocational Programs and Number of Such Schools in District					
	No Such Schools	1 School	2 Schools	3-5 Schools	6-10 Schools	11+ Schools
Vocational high school	77	19	2	1	*	*
Comp. high school with vocational programs	*	81	8	8	2	1
Total schools with vocational programs in district		64	21	10	2	3

* Less than 1 percent.

[a/] Weighted n=8,746; unweighted n=657.

Source: Janet P. Swartz, State and Local Response to the Perkins Act, Survey Analysis. (Cambridge, MA: Abt Associates) January 1989.

Table 1-3

District Enrollments in Districts that Do and Do Not
Send Students to an Area Vocational School (AVS), 1988

District Characteristic	Enrollment Grades 9-12				
	Mean	Standard Deviation	Median	Range	Total
Sends students to AVS[a/]	931	3,158	425	46-158,563	6,282,756
Does not send students to AVS[b/]	902	4,070	200	22-138,989	3,705,973

[a/] Weighted n = 6,744 districts; unweighted n = 433.

[b/] Weighted n = 4,108 districts ; unweighted n = 330.

Source: Janet P. Swartz, State and Local Response to the Perkins Act, Survey Analysis. (Cambridge, MA: Abt Associates) January 1989.

Area vocational schools are widely considered to provide greater depth of vocational offerings, but opportunities for attending area vocational schools also differ by location. Looking solely at the regular schools districts without separate vocational high schools, 74 percent of such districts in suburban areas offer students the option to attend area vocational schools. This is in contrast to 59 percent of such districts in urban areas and only 42 percent of such rural districts (Table 1-4). In general, then, very small school districts and rural school districts appear to offer fewer opportunities for their students to attend area vocational schools.[3]

The lack of opportunities to attend area schools in rural areas is particularly unfortunate because it also appears that students in rural areas take more occupationally-specific vocational

[3] As discussed later, however, enrollments in area vocational schools are only a small percentage of total vocational enrollment at the secondary level.

Table 1-4

Location of School District and Access to Area Vocational School, 1988

District Location	Percentage of Districts with Access to AVS
Urban	59
Suburban	74
Rural	42

Source: Janet P. Swartz, State and Local Response to the Perkins Act, Survey Analysis. (Cambridge, MA: Abt Associates) January 1989.

education than students in either urban or suburban areas (Table 1-5).[4] This finding comes from examining transcripts for high school students in the Class of 1982 and grouping the students by location--urban, suburban, or rural. Based on analysis of course credits, students in rural areas took considerably more occupationally specific vocational courses than students elsewhere. In rural areas, 59.18 percent of students took 2 or more occupationally specific Carnegie units during four years of high school, compared with 50.8 percent of students in suburban areas and 43.87 percent in urban areas. In addition, 26.99 percent of rural students took 3 or more units in a single occupationally specific field of study, compared with 20.4 percent of students in suburban areas and 17.19 percent of students in urban areas. This higher participation rate suggests a greater emphasis on direct job preparation in rural areas, for which the wider selection and greater depth of offerings in area schools would be most useful.

[4] This paragraph is based on a 1986 MPR analysis that included high school dropouts as well as graduates of the class of 1982.

Table 1-5

Percentages of Students Taking Occupationally Specific Courses, by Number of Credits Earned and School Location

High School Class of 1982

Location of School	Percentage of Students with any Credits	Number of Credits		
		<1	1-1.9	2+
Urban	66.03	8.27	13.89	43.87
Suburban	74.34	8.47	15.07	50.80
Rural	76.30	5.40	11.73	59.18

Source: High School and Beyond, Classifications of Secondary Vocational Education Courses and Students, MPR Associates, 1986 (draft document prepared for National Center for Educational Statistics).

Mix of Offerings

In regular school districts, the most common vocational offerings are programs in which girls are likely to predominate. Home economics courses are offered in 95 percent of regular districts, followed by business and office courses in 83.4 percent (Table 1-6). The next most common programs are ones more heavily subscribed by boys--including vocational agriculture (offered in 66.2 percent of regular districts), followed by trades and industries (offered in 59.7 percent of regular districts). No other broad vocational program area is offered in more than 50 percent of regular districts. Given that the majority of school districts offer vocational education in only one comprehensive high school, the lack of a broader range of vocational offerings in a majority is not surprising.

Table 1-6

National Estimates of Vocational Course Offerings in Regular School Districts and Secondary Area Vocational School (AVS) Districts, 1988

Program Area	Percentage Offering Program	
	Regular Districts[a]	AVS Districts[b]
Agriculture	66.2	60.2
Business and office	83.4	90.8
Distribution and marketing	39.6	66.7
Health	39.9	81.5
Home economics[c]	95.0	66.2
Technical	38.4	73.0
Trades and industries	59.7	100.0

[a] Weighted n = 6,196; unweighted n = 563.

[b] Weighted n = 581; unweighted n = 206.

[c] Category includes consumer and homemaking education as well as occupational home economics.

Source: Janet P. Swartz, State and Local Response to the Perkins Act, Survey Analysis. (Cambridge, MA: Abt Associates) January 1989.

The most common programs in area vocational school districts are somewhat more likely to attract boys. Fully 100 percent of the AVS districts in the sample report that they offer programs in trades and industries. Three additional programs with widespread availability in area school districts are business and office (offered in 90.8 percent of AVS districts), health occupations (in 81.5 percent of AVS districts), and technical occupations (in 73 percent of AVS districts). The latter two offerings

are notable in that they are not offered frequently in regular districts. Most of the area vocational districts in the sample report that their offerings are exclusively vocational. Only 13 percent report that they provide a full range of vocational and academic courses.[5]

The Goals of Vocational Education

Administrators in regular school districts and area school districts differed considerably in their goals for secondary programs, with area school district administrators in considerably greater agreement among themselves about the goals of vocational instruction. When asked to rank order a set of eight goals ranging from specific occupational preparation to mastery of basic skills to dropout prevention, the first choice of 69.4 percent of area vocational district respondents was "preparation for specific occupations" (Table 1-7). The next most common selection was "imparting general employability skills" but only 12.6 percent of AVS administrators selected that choice. Among the small minority of area school districts that offered a wide range of academic programs, however, 68 percent of the respondents indicated that "mastering basic skills" was among their top three goals.

Vocational administrators in regular districts were much more divided in their goals. Although the highest percentage of respondents selected "imparting general employability skills" as its highest goal, it was selected by only 27.7 percent of respondents. It was followed closely by "preparing students for further education," which was selected by another 26.7 percent and "enhancing awareness of occupations," selected by 19.1 percent. Regular school district respondents demonstrated no greater unanimity in selecting their second or third choices than they did their first. Interestingly, "specific occupational preparation" was selected as a first goal by only 12.9 percent of respondents and it ranked fourth as a second or third choice.

---

[5] The 13 percent excludes districts that indicated some availability of math or English instruction "related to" vocational offerings.

Table 1-7

National Estimates of Goals of Vocational Education Administrators in Regular School Districts and Secondary Area Vocational School (AVS) Districts, 1988

Goal of Vocational Education	Percent Rating as Primary Goal		Percent Rating as Second or Third Goal		Percent Not Rating as One of Top Three Goals	
	Regular Districts[a/]	AVS Districts[b/]	Regular Districts	AVS Districts	Regular Districts	AVS Districts
Access for disadvantaged and handicapped	4.7	0	18.8	31.0	76.5	69.0
Prepare for specific occupations	12.9	69.4	26.3	15.3	60.8	15.3
Impart general employability skills	27.7	12.6	41.4	39.8	30.9	47.6
Enhance awareness of various occupational areas	19.1	3.3	29.3	16.6	51.5	80.1
Prepare students for further education	26.7	5.6	44.3	50.3	29.0	44.1
Prepare students for transfer to other training	n/a	n/a	n/a	n/a	n/a	n/a
Ensure that students master basic skills	6.5	8.6	21.6	21.5	71.9	69.9
Stimulate economic development	0.2	0	1.0	13.0	98.9	87.0
Prevent students from dropping out of school	1.4	0	15.2	10.6	83.4	89.4
Meet the needs of specific employers	n/a	n/a	n/a	n/a	n/a	n/a

[a/] Weighted n = 8,453; unweighted n = 671.
[b/] Weighted n = 634; unweighted n = 222.

Source: Janet P. Swartz, State and Local Response to the Perkins Act, Survey Analysis. (Cambridge, MA: Abt Associates) January 1989.

There were, however, certain possible goals that did not appear to be among the top three choices, regardless of institutional affiliation. Among the least popular first choice goals in both types of districts were "dropout prevention," "ensuring basic skills," "economic development," and "promoting vocational access for disadvantaged or handicapped students." These goals were only minimally more popular as second or third choices, although "promoting access for disadvantaged or handicapped students" was cited by 31.7 percent of area vocational district administrators as a second or third goal, as was "mastering basic skills" by 21.6 percent of regular district vocational administrators. Since these are some of the most important goals of federal legislation, their lack of popularity with district-level administrators is of significance.

Recent Changes in Vocational Enrollments at Area Schools

In the past few years, vocational educators have sounded an alarm about declining enrollment in vocational offerings at the secondary level. In the NAVE survey, school district administrators indicated a decline in overall secondary enrollments roughly equivalent to the decline reported in national data, but they also reported increases in enrollment in some area vocational school districts. In general, districts in the survey reported that between the 1982-83 and 1986-87 school years, overall secondary vocational enrollments declined approximately 1 percent (Table 1-8). Surprisingly, the area vocational districts in the survey reported enrollment increases that averaged 6.5 percent, but the median change in AVS districts was actually a decline in enrollment of 1.4 percent. This finding suggests that increases in AVS enrollments were apparently limited and probably more concentrated in some larger AVS districts.

Table 1-8

Changes in Student Enrollment in Regular and AVS Districts, 1982-83 to 1986-87*

Enrollment Change	Percentage of Districts	
	Regular[a]	AVS[b]
>20% increase	8	12
11 - 20% increase	11	10
+/- 10% change	54	47
11 - 20% decrease	19	22
>20% decrease	12	6
Average Change	-1.6%	6.5%
Standard Deviation	14.6%	49.5%
Median Change	-3.5%	-1.4%

[a] Weighted n = 8,328; unweighted n = 644.

[b] Weighted n = 531; unweighted n = 190.

* Overall change, all districts = -1%.

Source: Janet P. Swartz, State and Local Response to the Perkins Act, Survey Analysis. (Cambridge, MA: Abt Associates) January 1989.

Changes in District Graduation Requirements

Perceived declines in vocational enrollment in the past few years have often been attributed to increased requirements for academic coursetaking. It is common to hear vocational educators say that more stringent graduation requirements have led students to take more academic courses and fewer vocational courses. Yet almost no information has been available on changes in graduation requirements at the district level--the level that actually determines the minimum program a student must complete for graduation. To determine whether there have been changes in requirements at the district level and the effects of those changes on coursetaking, regular school districts were asked about changes in academic and vocational requirements in the five years prior to the survey.

The districts did, in fact, report increases in academic course requirements over the period--particularly in mathematics, science, and social studies. At the beginning of the five-year period (1982-83), 58 percent of regular districts required the equivalent of between 2 and 2.5 Carnegie units (i.e., credits) of mathematics to graduate and only 6 percent required 3 to 3.5 units (Table 1-9). By the end of the period (1986-87) 68 percent of districts required 2 to 2.5 credits of mathematics and an additional 23 percent required 3-3.5 credits. Increases of a slightly lesser magnitude were also registered in science and social studies. In English, the change was not as great because most districts (77 percent) already required four credits of English for graduation at the start of the period.

During the same period, however, it appears that there were increases in the number of districts requiring vocational education for graduation (Table 1-10). While only 18 percent of districts required any vocational credits for graduation in 1982-83, 34 percent of districts had such requirements by 1986-87. Of those districts, most required one vocational credit and the remainder required between two and six units. In addition, 76 percent of all the districts in the survey allowed some academic unit requirements to be met through vocational courses. Given the increase in vocational requirements and the widespread willingness to allow vocational courses for some academic ones, it is possible that the potential effects of increased academic graduation requirements on vocational enrollments may have been mitigated somewhat.[6]

Recent Program and Policy Changes in Vocational Education

In addition to changes in enrollments, vocational education is also undergoing internal changes in content and direction. To capture some of those changes, the survey of school districts asked respondents about the extent to which various approaches or services related to vocational education had been "added or expanded," "reduced or discontinued," or unchanged or not offered over the five

---

[6] Actual changes in student coursetaking patterns are examined in the next chapter.

Table 1-9

National Estimates of Core Graduation Requirements in Regular School Districts, 1982-83 and 1986-87

Subject Area	Number of Credits Required	Percentage of Districts[a]	
		1982-83 School Year	1986-87 School Year
English	None	0.1	0.0
	0.5	0.0	0.0
	1-1.5	0.01	0.0
	2-2.5	1.0	0.3
	3-3.5	22.3	11.5
	4.0	76.6	87.6
	4+	0.4	0.6
Math	None	0.5	0.1
	0.5	0.2	0.04
	1-1.5	33.9	2.9
	2-2.5	58.1	67.5
	3-3.5	5.8	22.6
	4.0	1.2	1.4
	Math-Science comb.[b]	0.3	5.6
Science	None	0.6	0.1
	0.5	0.2	0.03
	1-1.5	44.1	11.4
	2-2.5	50.3	72.3
	3-3.5	4.4	10.1
	4.0	0.0	0.2
	Math-Science comb.[b]	0.3	5.8
Social Studies	None	0.04	0.0
	0.5	0.01	0.0
	1-1.5	12.6	3.9
	2-2.5	54.9	39.0
	3-3.5	29.4	47.8
	4.0	3.1	8.8
	4+	0.0	0.1

[a] Weighted n = 8,078; unweighted n = 718.

[b] Requirement for a combined total of math and science credits. Most often, students have the option to take 2-3 math units and 2-3 science units for a total of 5.

Source: Janet P. Swartz, State and Local Response to the Perkins Act, Survey Analysis. (Cambridge, MA: Abt Associates) January 1989.

Table 1-10

Percentage of Regular Districts Requiring Vocational Credits for Graduation and Number of Credits Required, 1982-83 and 1986-87

School Year	Total Percentage with Vocational Requirement	Percent Requiring $\leq$1.9 Units	Percent Requiring More than 1.9 Units
1982-83	18	14	4
1986-87	34	24	10

Source: Janet P. Swartz, State and Local Response to the Perkins Act, Survey Analysis. (Cambridge, MA: Abt Associates) January 1989.

years prior to the survey. In general, respondents were more likely to indicate that offerings were added or expanded over that period.

For regular school districts, responding to advances in technology was the most common area of program expansion, but it was followed by a variety of changes that reflected federal policy priorities (Table 1-11). Sixty-two percent of districts indicated that they had added or expanded course content, services, or other activities in response to technological change. The next four most common changes reflected federal vocational policy concerns, including expanding supplemental services for handicapped or disadvantaged students (48.3 percent of districts), assessing vocational interests and abilities (43.8 percent of districts--assessments were a new federal mandate for disadvantaged and handicapped students in the Perkins Act), vocational guidance and counseling (43.5 percent of districts), and remedial basic skill instruction (40.4 percent of districts).

Table 1-11

Changes Over the Last Five Years in Course Content, Supplemental Services and Other Program Activities in School Districts

	Percentage of Districts[a/]			
	Added or Expanded	Reduced or Discontinued	No Change	Not Offered
General or transferable vocational skills courses (e.g., Principles of Technology)	33.1	1.4	43.2	22.3
Specific occupational skills training	38.3	5.6	49.7	6.5
Remedial basic skills instruction	40.4	1.7	46.6	11.3
Integrated math and science curriculum	21.5	0.5	52.6	25.4
Work experience programs	18.5	5.9	51.7	24.0
Career exploration	40.6	1.9	49.8	7.7
Responses to advances in technology	62.1	0.2	26.5	11.2
Assessment of interests and abilities in vocational education	43.8	0.5	49.5	6.2
Vocational guidance/counseling	43.5	2.5	46.9	7.1
Supplemental services for handicapped or disadvantaged students	48.3	0.5	42.1	9.1
Activities to promote sex equity	32.8	0.3	51.8	15.0
Articulation agreements with postsecondary institutions	24.6	0.0	48.9	26.5
Integrated curriculum offerings with postsecondary institutions	15.8	0.4	50.2	33.6
Student leadership programs	29.3	1.6	60.9	8.3
Job placement activities	24.5	1.0	59.5	15.0

[a/] Weighted n=6,436; unweighted n=545.

Source: Janet P. Swartz, State and Local Response to the Perkins Act, Survey Analysis. (Cambridge, MA: Abt Associates) January 1989.

Interestingly, some of the areas least likely to have been expanded in the five years before the 1988 survey have emerged as federal priorities under the 1990 Amendments to the Perkins Act. These included the area least likely to have been added or expanded, which was integrated curriculum offerings with postsecondary institutions (15.8 percent of districts), as well as integrated math and science curriculum (21.5 percent of districts). Also among the areas least likely to have undergone expansion were work experience programs (18.5 percent of districts) and articulation agreements with postsecondary institutions (24.6 percent of districts).

For vocational area school districts, all possible areas of expansion or addition were heavily subscribed (Table 1-12). The most common areas of expansion were similar, with all but the top item (responses to advances in technology--79.7 percent of districts) also reflecting federal concerns, even more heavily than in regular districts. They included supplemental services for handicapped or disadvantaged students (73.1 percent of districts) and remedial basic skill instruction (70.4 percent of districts). Interestingly, however, area school districts rated articulation agreements with postsecondary institutions as a major area of expansion (67.7 percent of districts). Work experience was the least likely area to have been added or expanded (28.3 percent of districts had done so).

VOCATIONAL EDUCATION AT THE SCHOOL LEVEL

Almost all districts offer vocational education, but this should not be taken to imply that all students have comparable access to vocational programs. As seen earlier, participation differs by region and access to area schools differs by district size and urbanicity. To understand the extent of student access, NAVE also examined the availability of vocational education at the local level.[7] Because the NAVE sought to address federal legislative concerns, its analysis focused on the potential for differential access to vocational education by disadvantaged students. Its school-level analysis

[7] The analysis on which this discussion is based was conducted by John Wirt and Larry Hodgkiss and is reported in the NAVE *Final Report*, Volume V, Chapter 3.

Table 1-12

Changes Over the Last Five Years in Course Content, Supplemental Services and Other Program Activities in Secondary Area Vocational Schools

	Percentage of Schools[a]			
	Added or Expanded	Reduced or Discontinued	No Change	Not Offered
General or transferable vocational skills courses (e.g., Principles of Technology)	47.4	5.3	24.0	23.2
Specific occupational skills training	57.4	7.9	34.2	0.5
Remedial basic skills instruction	70.4	0.0	23.6	6.0
Integrated math and science curriculum	48.9	1.2	28.8	21.2
Work experience programs	28.3	6.3	56.0	9.4
Career exploration	38.5	2.7	46.6	12.1
Responses to advances in technology	79.7	0.2	15.5	4.6
Assessment of interests and abilities in vocational education	62.6	1.0	34.9	1.5
Vocational guidance/counseling	52.4	1.7	43.7	2.2
Supplemental services for handicapped or disadvantaged students	73.1	1.5	25.4	0.0
Activities to promote sex equity	58.7	0.5	39.4	1.4
Articulation agreements with postsecondary institutions	67.7	0.0	24.1	8.2
Integrated curriculum offerings with postsecondary institutions	43.5	0.0	40.6	15.8
Student leadership programs	53.3	2.0	44.3	0.4
Job placement activities	52.1	2.0	43.8	2.1

[a] Weighted n=550; unweighted n=192.

Source: Janet P. Swartz, State and Local Response to the Perkins Act, Survey Analysis. (Cambridge, MA: Abt Associates) January 1989.

examined whether schools that varied with respect to average student achievement and average student poverty level also differed with respect to vocational program and course opportunities.

The school-level analysis used two youth data sets that yield information on the delivery of vocational education at the school level. They were the High School and Beyond sophomore cohort (HS&B--Class of 1982) and transcripts collected from a nationally representative sample of the high school Class of 1987 (HSTS). The HS&B data set also included institutional information for each of the schools attended by students in the sample.

Student Composition and Access to Vocational Education (HS&B--Class of 1982)

Public schools attended by students in the HS&B sophomore cohort were grouped into four quartiles, using a composite indicator that included the school's average student achievement, family income, and socioeconomic status.[8] The quartiles of schools were labeled "highly disadvantaged" (the lowest quartile), "medium disadvantaged," "medium advantaged," and "highly advantaged" (the highest quartile) based on the characteristics of their student bodies. Multiple regression analysis was used to estimate the effects of school advantage/disadvantage on the availability of various types of vocational education.

In general, schools with "medium advantaged" student bodies appeared to have the greatest availability of options for vocational education (Table 1-13). Students in these schools were most likely to have access to an area vocational facility, as 75.9 percent of these schools offered their

[8] SES was itself a composite variable that included average parents' education, average status of parents' occupations, and average number of siblings of students. For a detailed description of the percentage of all schools by quartiles of average family income and average academic ability, see Table 3.17, NAVE *Final Report* Volume, V. Thirty-seven percent of the schools in the HS&B sample were in equivalent quartiles on both indicators and, hence, were included in the analysis. Findings in this section are regression estimates that control for school size, percent of minority students, urbanicity, and region.

students the opportunity to attend such a facility. They were followed closely by the "medium disadvantaged" group of schools with 74 percent reporting access to area vocational schools. At the low end, however, only 45.2 percent of the quartile of schools with "highly disadvantaged" populations provided access to area facilities. With respect to opportunities to gain work experience in a vocational field, the picture was a bit more mixed. "Medium advantaged" schools had the highest level of work-study opportunities, with 71 percent reporting that they offered this option. With respect to opportunities for cooperative education, this set of schools ranked second--with "medium disadvantaged" schools most likely to offer this option.

The "medium advantaged" schools also had the greatest total number of vocational offerings although they did not offer the most advanced courses. The typical "medium advantaged" school enabled students to choose from among vocational courses totalling 48.75 credits, twice the 29.14 average course credits available in "highly disadvantaged" schools. Schools in the "highly advantaged" quartile offered almost as many vocational credits--46.44--while "medium disadvantaged" schools offered an average choice from among 36.52 vocational credits. The greatest number of advanced vocational courses was found in the highest quartile, the "highly advantaged" schools, which offered an average of 14.80 credits in advanced courses.

The quartile of schools with the greatest concentrations of disadvantaged students had considerably fewer vocational options overall (see Table 1-13). These schools offered the fewest opportunities to attend specialized vocational facilities or enroll in cooperative education. They also ranked second from the bottom in work-study opportunities for high school students. They had the fewest vocational program areas from which to choose, and the least depth, (i.e., the smallest number of different courses) in the programs that they did offer. In addition, the "highly disadvantaged" schools offered an average of only 7.73 credits in advanced vocational courses--the lowest availability rate for such courses among the four groups of schools.

Table 1-13

Estimated Quality of Vocational Education by School Level Concentration of Disadvantaged Students

School/Program Characteristics	Percentage of Highly Disadvantaged	Percentage of Medium Disadvantaged	Percentage of Medium Advantaged	Percentage of Highly Advantaged
Percentage of schools that offer:				
Area vocational center	45.2	74.0	74.9	64.7
Cooperative education	55.1	68.2	58.7	57.0
Work-study	58.6	50.3	71.0	66.8
Levels of vocational education offered				
Total no. of credits offered (all courses)	29.14	36.52	48.75	46.44
Program areas with at least 1 course	3.55	4.53	5.34	5.27
Program areas with at least 3 courses	2.36	2.72	3.29	3.30
No. of credits at 2nd level or above	7.73	11.26	12.79	14.80
Vocational course enrollments (number of credits)*				
General labor market preparation	1.28	1.16	1.13	0.83
Consumer and home economics	1.40	0.99	0.67	0.38
Occupationally specific	3.81	3.85	2.72	2.05
Amount in student's primary area	2.88	2.72	2.10	1.48
Total all types[a]	6.49	6.00	4.52	3.26
Percentage occupationally specific	58.7%	64.2%	58.9%	62.9%
Percentage in student's primary area[b]	44.4%	45.3%	45.5%	45.4%
Academic course enrollments (number of credits)*				
Basic and remedial	5.19	4.42	4.87	5.31
Regular	6.16	7.52	8.42	10.13
Advanced and specialized	0.71	0.72	0.86	0.82
Total all types	12.06	12.66	14.15	16.26
All subject areas (number of credits)*				
Academic	12.06	12.66	14.15	16.26
Vocational	6.49	6.00	4.52	3.26
Personal/other	2.46	2.59	2.57	2.48
Total	21.01	21.25	21.24	22.00
Average school enrollment	650	832	926	1,042

Note: Degree of school disadvantage measured by quartiles of average family income, student academic ability, and socioeconomic status when region, urbanicity, and percent minority were held statistically constant.

[a] Total includes general labor market preparation, consumer and home economics, and occupationally specific courses.

[b] Percentage of occupationally specific courses.

* Secondary School Course Taxonomy from which vocational and academic enrollments are determined is described in the next main chapter of this report.

Source: High School and Beyond Survey, Sophomore Cohort.

The lack of vocational options in "highly disadvantaged" schools is particularly troubling because students in these schools take more vocational education (and less academic instruction) than students in other, more advantaged schools. Students in "highly disadvantaged" schools took an average of 6.49 vocational credits over four years of high school, compared with 6.0 credits in "medium disadvantaged" schools, 4.52 credits in "medium advantaged," and 3.26 credits in "highly advantaged" schools. In contrast, the students in "highly disadvantaged" schools took the least academic instruction--12.06 credits--while students in the most advantaged schools took an average of 16.26 academic credits. In other words, although they have fewer vocational options, students in the poorest schools are the most dependent on vocational courses for their high school education.

Area Schools, Regular Schools, and the Delivery of Vocational Education (HSTS--Class of 1987)

The collection of transcript data for the Class of 1987 was accompanied by the collection of course catalogues, providing some ability to determine where the credits were earned.[9] As a result, it is possible to construct a picture of the mix of coursetaking in comprehensive high schools, area vocational schools, and other locations. Because of the study's particular interest in special populations, part of the analysis explores the types of institutions in which handicapped and disadvantaged students participated in vocational education. These findings parallel and reinforce the findings of the national survey of districts reported earlier.

Most high school vocational education is taken in regular high schools (Table 1-14). Nonhandicapped students (approximately 95 percent of students in the sample) took an average of 84 percent of their vocational courses in their home high schools. They took an additional 8.8 percent of their vocational courses in area vocational facilities and 6.9 percent in institutions classified as "other." The "other" categories includes courses for which a location could not be determined and may include courses taken in

[9] This discussion is based on an analysis conducted by Becky Jon Hayward. For more information, see NAVE *Final Report*, Volume V.

community colleges as well as some courses taken in area schools and home high schools.[10] Although they took more vocational education elsewhere, handicapped students also took 62.5 percent in regular high schools.

Table 1-14

Location of High School Graduates Vocational Courses, as a Percentage of all Credits Earned in Vocational Education, Class of 1987

Students	Percentage of All Vocational Education Taken In:			
	Home High School	Area Voc. School	All Other Locations	Total
Nonhandicapped*	84.32	8.79	6.89	100.00
Handicapped	62.48	16.00	21.52	100.00

* Approximately 95 percent of all students in sample.

Source: Handicapped and Disadvantaged Students: Access to Quality Vocational Education, NAVE Final Report, Volume V (Washington, DC: GPO) May 1989, p-28.

The vocational education offered in area vocational facilities is qualitatively different from that offered in schools overall (Table 1-15). Of the credits earned at area vocational facilities, more than half were in trades and industries (50.44 percent) and included precision production (19.3 percent of all offerings), mechanics and repair (19.17 percent), and construction trades (11.84 percent). In schools as a whole, trades and industries courses account for 21.62 percent of offerings. The next most common area school offering was occupational home economics, which accounted for 15.62

[10] This category was used when the same course was available to a student in the sample in both their home high school and an area school and the transcript did not reveal the institution in which it was taken.

percent of the credits earned at area facilities, although this field accounts for only 4.28 percent of all secondary vocational credits. Though they comprise 21.65 percent of all offerings, business occupations accounted for only 11.41 percent of area school offerings. No other field accounted for more than 5 percent of offerings. Interestingly, area schools are underrepresented in course offerings in the technical/communications area, the fastest growing field in vocational instruction. In short, courses in area facilities are concentrated in a limited number of occupationally specific vocational fields, and weighted to those fields that have traditionally enrolled boys.[11]

SUMMARY

What emerges from this overview is a picture of vocational education availability that suggests differences in availability by region, size and urbanicity of district, and among different types of institutions. Vocational enrollments appear greatest in communities of the North Central and Southeastern U.S. At the same time, instructional options (such as specialized facilities) are most available in larger districts and in districts located in suburban areas. These options are less available in rural schools, schools in small districts, and schools with high concentrations of disadvantaged students. While almost all students have some opportunity to enroll in vocational education in their regular high school, those with access to area schools probably have a greater opportunity to enroll in occupationally specific courses in areas such as trades and industries and health.

[11] Overall vocational coursetaking rates are discussed in the next chapter of this report.

Table 1-15

Profile of Vocational Education in Area Vocational Schools and All Schools Based on Credits Earned in Vocational Subjects

Class of 1987

Subject	Percentage of Total Vocational Credits	
	All Schools	Area Schools
Consumer and homemaking education	13.51	0.70
General labor market preparation	20.95	3.92
Specific labor market preparation	65.32	95.37
Agriculture	4.28	4.20
Business	21.85	11.41
Marketing	3.60	2.43
Health	1.58	4.96
Occupational home economic	4.28	15.62
Trades and industries	21.62	50.44
Construction	2.48	11.84
Mech/rep.	4.95	19.17
Precision	14.19	19.30
Transport	N/A	0.13
Technical/communication	5.41	3.55
Other	N/A	2.79

Due to rounding, not all percentages add to 100.

Source: 1987 High School Transcript Study. Unpublished data.

Chapter 2

Patterns of Vocational and Academic High School Coursetaking

Up to this point in the discussion, participation in vocational education has been described from the institutional perspective--i.e., focusing on the places where vocational education is offered. This chapter examines coursetaking from the perspective of high school students. It describes the extent to which vocational education plays a role in students' high school instructional experience and explores the changes that have occurred in that role over almost two decades. To accomplish this, the chapter describes participation, and changes in participation over time, in both academic and vocational courses. The first half of the chapter addresses the coursetaking patterns of students as a whole, while the second half describes the coursetaking patterns of subgroups of the student population.

Much of the information in this section of the report is based upon an analysis of high school transcripts carried out for the NAVE by MPR Associates.[12] That analysis compared information from transcript records compiled for high school classes included in major longitudinal youth data sets that span the high school graduating classes of 1969, 1975-78 (combined), 1979-1982 (combined), 1982, and 1987.[13] In particular, the analysis examined changes in coursetaking patterns during the 1980s, comparing the mix of courses taken by the classes of 1982 and 1987.

---

[12] The work at MPR was conducted under the leadership of John Tuma, with consultation from Robert Meyer at NAVE.

[13] The specific data sets include the Educational Testing Service Study of Academic Prediction and Growth (1969 high school graduates), the National Longitudinal Survey of Labor Force Experiences--Youth Cohorts (1975-1982 high school graduates), High School and Beyond Sophomore Cohort (1982 high school graduates), and the NAEP High School Transcript Study (1987 high school graduates). Because there were not sufficient graduates in any one year of the data set, data from the NLS-Youth cohorts were aggregated into two groups (1975-78 and 1979-82) to ensure sufficient students for analysis.

The MPR analysis was made possible by the creation of a taxonomy of high school courses developed by MPR and Robert Meyer at NAVE. The taxonomy grouped courses into three broad areas--vocational, academic and personal/other--then by subject areas (and by general/specific occupational preparation for vocational subjects) within the three broad areas. Finer distinctions were made when subject-area course titles allowed and these will be noted as coursetaking patterns are described.[14] Unfortunately, transcript information from some of the earlier data sets was not coded in sufficient detail when it was originally compiled to apply the taxonomy in full. As a result, certain coursetaking information is inconsistent or missing for some of the early cohorts. This is not the case, however, for the classes of 1982 and 1987.

OVERALL TRENDS IN ACADEMIC AND VOCATIONAL COURSETAKING

Between the Class of 1969 and the Class of 1987 there were two, somewhat distinct, periods of high school coursetaking. From the late 1960s until the beginning of the 1980s, high school graduates increased their overall credits slowly over time, enrolling in fewer academic courses and more courses in vocational education and personal service.[15] In the 1980s, the increase in overall credits became more rapid and was characterized by a sizeable shift back to academic courses and a slight decline in vocational coursetaking. Personal service coursetaking remained relatively constant.[16]

Students in the Class of 1969 took fewer total credits, on average, than subsequent classes, but academic courses occupied a larger share of their coursework than was the case for subsequent

---

[14] The taxonomy is available from James Houser at the National Center for Educational Statistics.

[15] One cannot assume that this trend began in the late 1960s; that is simply the first data point in this analysis.

[16] The personal use and "other" category includes such courses as family life education, health education, and driver education/training. See course taxonomy

classes. (Table 2-1). The 1969 high school graduates (i.e., high school students over the period 1965-1969) took an average of 20.46 Carnegie units (or credits) over four years, with 14.89 of those credits in academic courses, 3.67 in vocational education and 1.90 in personal service courses. Stated in terms of relative amounts--academic courses were 72.7 percent of a typical high school program, vocational courses were 17.9 percent, and personal service courses were 9.3 percent.[17]

Table 2-1

Average Number of Credits Completed by Public High School Graduates, 1969-1987

	Class(es) of:				
	1969	1975-1978	1979-1982	1982	1987
Total Credits	20.46	20.76	21.19	21.44	22.77
Academic	14.89	13.96	13.90	14.17	15.64
Vocational	3.67	4.50	4.89	4.64	4.44
Personal use	1.90	2.30	2.40	2.63	2.69
Percent of Credits					
Academic	72.7	67.2	65.6	66.0	69.1
Vocational	17.9	21.7	23.1	21.6	19.5
Personal use	9.3	11.1	11.3	12.2	11.4

Source: John Tuma et al., "Enrollment Trends in Vocational and Academic Education in American Public High Schools, 1969-1987," (Berkeley, CA: MPR Associates), 1989.

[17] Because credits are averaged across all students, average credits in a program that did not enroll all students could be misleading. This is not a major factor in the analysis, however, because all students took academic courses and almost all students took vocational courses in all time periods. The one (relatively minor) exception is vocational enrollments for the class of 1969, because only 92 percent of the graduates enrolled in some vocational education. For those students, the average number of credits taken was 3.99.

The high school students of the 1970s (classes of 1975-78 combined, and 1979-82 combined) took increasing amounts of vocational education and decreasing amounts of academic instruction. The relative share of a high school program devoted to vocational education increased. Average academic coursetaking declined by a full credit between the class of 1969 and the classes of 1975-78, from 14.89 to 13.96 credits, and remained at 13.90 for the classes of 1978-82. At the same time, vocational coursetaking increased from 3.67 to 4.50 credits for the classes of 1975-78 and then increased further to 4.89 credits for the classes of 1978-82. All told, this was a 33 percent increase in vocational credits over the period.[18] This change meant that vocational education went from about 17.9 percent of high school courses to 23.1 percent--a rather substantial 29 percent increase in relative share in a little over a decade. At the same time, academic coursetaking declined from 72.7 to 65.6 percent of all courses in high school--a nine percent decrease in relative share of high school offerings. Personal service courses rose slightly, to 2.40 credits or 11.3 percent of the curriculum--a 21.5 percent increase in the role of this set of courses for the typical student.

Despite changes in total credits accumulated, there was a drop off in coursetaking in the senior year for all classes. Throughout the period under examination, students took roughly equivalent numbers of credits in each of the first three years of high school and fewer in their senior year (Table 2-2). There did appear to be slight increase in senior year coursetaking over time, however, with 12th-grade courses accounting for 20.4 percent of all courses taken by the class of 1969 and 23.2 percent of all courses taken by the class of 1987.[19]

These data do little to explain why shifts in coursetaking occurred; they simply document that changes in coursetaking occurred. While these data appear to substantiate the "conventional wisdom"

---

[18] A small percentage of the increase is due to the increase in total student participation in vocational education--from 92 percent to 98 percent of students (see previous footnote).

[19] Problems in coding the 1987 transcript data made it impossible to attribute all courses to grade levels, so this conclusion should be considered tentative.

Table 2-2

Average Credits Earned by Grade Level for High School Graduates, 1969-1987

	Class(es) of:				
	1969	1975-1978	1979-1982	1982	1987
Grade Level					
9th Grade	5.50	5.36	5.44	5.56	4.91
10th Grade	5.40	5.47	5.54	5.58	4.87
11th Grade	5.40	5.27	5.42	5.43	4.87
12th Grade	4.17	4.62	4.78	4.83	4.42
Grade unknown	--	0.05	0.01	0.07	3.70

Source: John Tuma et al., "Enrollment Trends in Vocational and Academic Education in American Public High Schools, 1969-1987," (Berkeley, CA: MPR Associates), 1989.

that students took fewer academic courses over the decade of the 1970s, they do not appear to substantiate the other part of that "wisdom," namely, that overall high school credit hours declined as well. In fact, total hours of instruction for a typical student increased slightly over the period. The data also demonstrate some relative trade-off between academic and vocational/personal service coursetaking--of about one credit--during the period--since total credits earned did not increase as rapidly as participation in vocational and personal service programs.

During the 1980s, overall coursetaking patterns shifted rather dramatically. Using the 1979-82 cohort as the baseline, total average credits rose 1.58 by the Class of 1987, more than double the rate of increase for cohorts in the previous decade. (See Table 2-1)[20] Further, almost all of the increase took place in academic coursetaking. The average student in the class of 1987 took 1.74

[20] Here we are comparing the changes described for the classes of 1969 through 1979/82 with the changes for the classes 1979/82 through 1987.

more academic credits than the average student in the classes of 1979-82. Personal service courses also increased by .29 of a credit over that period.

Because the combined increase in academic and personal service coursetaking was greater than the increase in total credit hours, it may also be said to have "eaten into" other parts of the curriculum--i.e., into vocational education. During the same period, the typical student's vocational credits declined .45 of a credit, meaning that personal service and, especially, academic coursetaking increases took a small "bite" out of vocational education. Vocational education relinquished the instructional hours that were not gained from the increase in average total credit hours.

For vocational education, the overall story in the period from 1969 through 1987 appears to be one of rapid expansion followed by small declines in enrollment. The MPR report sees the picture as relatively positive, concluding that:

> ...the smallness of the decline illustrates that students...were willing to increase the total number of courses they completed rather than give up their vocational electives. This finding should be encouraging to vocational educators, many of whom expressed concern that increased academic graduation requirements would lead to the demise of the vocational enterprise....While too early to say conclusively, the educational reform movement does not seem to have compelled students to drop vocational electives.[21]

The MPR view is one possible interpretation of the findings, but it seems unlikely that the increase in total credits is due to students' desire to take vocational education. After all, the 1980s was the decade of academic reform and increasing credit requirements for graduation. Further, this explanation of the data fails to explain why vocational educators around the country report alarming declines in course enrollment. Are they all mistaken?

Probably not. There are alternative explanations of these data that help explain the widely reported phenomenon of declining enrollment in vocational education. First, these data suggest that

---

[21] John Tuma, Antoinette Gifford, Laura Horn, E. Gareth Hoachlander, "Enrollment Trends in Vocational and Academic Education in American Public High Schools, 1969-1987," (Berkeley, CA: MPR Associates), April 1989, pp. 15-16.

taking more academic credits *does* affect vocational coursetaking negatively, although, as indicated previously, the effect is smaller than the increase in academic credits. (In contrast, the increase in academic coursetaking does not appear to be affecting participation in personal service courses.) And even a small decline in the average students' vocational credits can mean a large decline in vocational coursetaking. The reason is that the small decline in average credits occurred during a period in which the high-school-age population declined by 4.5 percent. This means that the decline of a half credit actually translates into a decline of around 9-10 percent in the *absolute* number of vocational credits earned (or classes held) around the country. Fewer classes mean a declining demand for vocational instructors, particularly noticeable as the demand for academic instructors increases.

At first glance, the overall changes in coursetaking patterns over the past two decades appear to reflect widely perceived changes in school performance and education policy. The reforms of the 1980s--increases in state and local overall and academic credit requirements for high school graduation--were undertaken in response to declining student achievement. That decline was, in turn, attributed to slackened participation in rigorous academic courses. From these data, declining academic participation does appear to have occurred, and increases in overall credits and academic credits in the 1980s would appear to be the effects of policies aimed at reversing the trend. Yet as will be discussed in the next sections of this chapter, not all the changes in coursetaking have occurred in a manner that might have been predicted from the newly enacted policies. These sections will describe coursetaking patterns within each broad subject area and for particular subgroups of students.

DETAILED EXAMINATION OF ACADEMIC AND VOCATIONAL COURSETAKING

Changes in Coursetaking: Academic Subject Areas

Mathematics: The overall changes in academic coursetaking described above were also generally reflected in coursetaking patterns for each of the four "core" academic subject areas--

mathematics, science, English, and social studies--as well as foreign language and fine arts, but the coursetaking trends were not entirely identical (Table 2-3). In mathematics, the decline in enrollment in the 1970s was slight, and the rebound began considerably earlier than in other subjects. Average mathematics credits declined from 2.47 for the class of 1969 to 2.35 for the classes of 1975-78, and began to rebound thereafter. The 1969 level of coursetaking was surpassed by the class of 1982. Nonetheless, the increase in coursetaking was most rapid in the 1980s, when average math credits jumped by the equivalent of a semester--from an average of 2.55 to 3.02 credits.

Table 2-3

Average Number of Credits Earned by Public High School Graduates in Academic Subjects, 1969 to 1987

Class(es) of	Course Credits					
	Math	Science	English	Social Studies	Fine Arts	Foreign Language
1969	2.47	2.23	4.07	3.39	1.17	1.57
1975-1978	2.35	2.26	3.69	3.15	1.40	1.11
1979-1982	2.44	2.18	3.76	3.12	1.47	0.92
1982	2.55	2.17	3.87	3.16	1.46	0.97
1987	3.02	2.51	4.00	3.31	1.42	1.36

Source: John Tuma et al., "Enrollment Trends in Vocational and Academic Education in American Public High Schools, 1969-1987," (Berkeley, CA: MPR Associates), 1989.

Despite the overall increase in average math credits since the late 1970s, it is taking considerably longer to equal the 1969 rates of participation in some college-preparation math courses (Table 2-4). Total math credits were slightly higher for the class of 1982 than the class of 1969, but

rates of enrollment in algebra, geometry and advanced mathematics remained lower.[22] By the class of 1987, however, 1969 participation rates in geometry and advanced math were surpassed, although participation in algebra remained lower. The greatest math enrollment increases in the 1980s occurred in applied mathematics courses--a mixed category including such disparate courses as introduction to computers, consumer math, and vocational math.[23]

Table 2-4

Percentage of High School Graduates with Credits
Earned in Certain Mathematics Courses, 1969-1987

	Percentage of Class(es) of:				
	1969	1975-1978	1979-1982	1982	1987
Math					
Basic	30.03	14.86	8.78	9.14	11.56
General	21.29	30.12	35.16	34.82	26.89
Applied	3.03	7.59	11.39	16.15	31.01
Pre-Algebra	*	8.68	8.99	20.91	22.19
Algebra	73.23	61.01	64.22	55.63	65.61
Geometry	51.29	46.92	47.99	45.59	58.71
Calculus	1.05	2.37	2.98	4.61	6.49
Advanced/Other	42.19	36.84	40.90	40.72	48.59

Source: John Tuma et al., "Enrollment Trends in Vocational and Academic Education in American Public High Schools, 1969-1987," (Berkeley, CA: MPR Associates), 1989.

Science: Enrollments in high school science declined later than in math, and did not begin to rebound until the 1980s (see Table 2-3). Science credits were actually highest for the high school

---

[22] "Advanced mathematics" includes trigonometry, advanced algebra, calculus, and statistics.

[23] Although the greatest increases have not been registered entirely in higher level math courses, this picture of increased participation is quite different from that developed by other studies. Some recent reports contend that increased math participation in the 1980s was due to greater participation in low level courses, some of which were "upgraded" in name only.

classes of 1975-78 (an average of 2.26 credits) and then dropped, bottoming out at 2.17 credits for the class of 1982. They increased at about the same rate as mathematics credits between the classes of 1982 and 1987. In biology and chemistry, the participation rates in 1987 exceeded those of the mid 1970s, but in physics the 1987 participation rate remained considerably lower (Table 2-5). Up and down shifts in the percentage of students taking physics, and a dramatic upswing in participation in science survey courses from the late 1970s onward, appear to account for much of the overall change in science enrollment over the two decades. Like applied mathematics, survey science is a mixed category including very basic courses as well as a wide range of specialized, advanced courses not otherwise classifiable.

Table 2-5

Percentage of High School Graduates with Credits
Earned in Science Courses, 1969-1987

	Percentage of Class(es) of:				
	1969	1975-1978	1979-1982	1982	1987
Science					
Survey	71.55	51.08	49.89	70.18	72.18
Biology	86.14	83.56	79.63	79.31	89.39
Chemistry	36.75	35.85	33.29	32.19	42.66
Physics	13.36	33.51	36.69	16.93	20.14

Source: John Tuma et al., "Enrollment Trends in Vocational and Academic Education in American Public High Schools, 1969-1987," (Berkeley, CA: MPR Associates), 1989.

English: Unlike science and math, participation in English does not appear to have increased much in the 1980s. In fact, rates of enrollment in some parts of the program were considerably greater in the 1970s (Table 2-6). Since almost all students take an English survey course during each year of high school and have done so throughout the two decades of transcript records, there is not

much fluctuation in overall English enrollments over the period. There have been changes, however, in non-survey English course participation and the trend is not positive. Participation in literature and composition courses rose in the 1970s and dropped rather steeply between the classes of 1982 and 1987. By 1987, the average credits earned in English had not reached the 1969 level.

Table 2-6

Percentage of High School Graduates with Credits
Earned in English Courses, 1969-1987

	Percentage of Class(es) of:				
	1969	1975-1978	1979-1982	1982	1987
English					
Survey	99.90	98.30	98.27	98.16	99.52
Literature	2.03	43.07	41.99	45.41	29.60
Composition	8.09	32.46	36.61	33.92	24.99
Speech	17.38	20.46	23.67	19.90	19.28

Source: John Tuma et al., "Enrollment Trends in Vocational and Academic Education in American Public High Schools, 1969-1987," (Berkeley, CA: MPR Associates), 1989.

Social Studies: Like English, total social studies credits in 1987 did not reach the level of 1969 although they were little changed over the period. Almost all students took American History courses over the entire period, and enrollment in World History was actually lowest for the classes of 1982 and 1987 (Table 2-7). The biggest enrollment increase over the two decades was in a "catch-all" category called social science that includes courses in humanities as well as traditional social sciences (economics, psychology, etc.), specialized courses on particular regions of the world or ethnic groups, and a variety of other courses not classifiable elsewhere. Participation in these courses doubled over the period under examination.

Table 2-7

Percentage of High School Graduates with Credits
Earned in Social Studies Courses, 1969-1987

	Percentage of Class(es) of:				
	1969	1975-1978	1979-1982	1982	1987
Social Studies					
American History	98.71	93.43	94.37	88.26	93.15
World History	78.27	52.60	52.27	42.81	46.75
American Government	86.97	61.15	61.69	63.67	72.77
Social Science	41.17	75.73	78.53	80.85	81.90

Source: John Tuma et al., "Enrollment Trends in Vocational and Academic Education in American Public High Schools, 1969-1987," (Berkeley, CA: MPR Associates), 1989.

Foreign Language and Fine Arts: After a steady enrollment decline from the class of 1969 onward, participation in foreign language courses experienced a substantial increase during the 1980s. Most of that increase was in the percentage of students enrolling in Spanish, with a smaller resurgence in French (Table 2-8). The percentage of all students taking some foreign language ended the two decades at 63.61 percent, only slightly lower than it began (65.76 percent)--an encouraging trend. Fine arts participation has remained relatively steady since the mid 1970s.

Summary: Changes in academic course participation varied by subject area during the period under examination. Participation in math and foreign language fit the "decline in the 1970s followed by increased participation in the 1980s" mold, but other fields did not. Participation in English, social studies, and fine arts remained relatively stable throughout the period. Participation in science was rather mixed, with declining participation coming only late in the 1970s. In the 1980s, participation in some portions of the science curriculum rebounded, while participation in other portions showed no particular trend.

Table 2-8

Percentage of High School Graduates with Credits
Earned in Foreign Language and Fine Arts, 1969-1987

	Percentage of Class(es) of:				
	1969	1975-1978	1979-1982	1982	1987
Foreign Language					
All Foreign Language	65.76	54.31	49.21	49.33	63.61
Year 1	63.08	48.50	43.57	44.20	58.78
Year 2	47.81	33.88	26.66	28.92	41.40
Year 3 or more	19.11	14.40	11.33	13.61	17.22
French	26.64	16.64	14.72	15.95	20.12
Spanish	29.80	30.34	28.20	29.29	38.43
Latin	10.24	3.87	2.21	3.32	3.65
German	7.98	6.89	6.31	4.58	5.27
Fine Arts					
All Fine Arts	63.28	66.93	68.04	68.02	67.09
Arts & Crafts	35.30	41.23	43.24	45.20	40.98
Music	36.36	36.03	36.15	35.56	34.76
Drama/Dance	8.55	10.93	10.65	8.45	12.49

Source: John Tuma et al., "Enrollment Trends in Vocational and Academic Education in American Public High Schools, 1969-1987," (Berkeley, CA: MPR Associates), 1989.

Changes in Coursetaking: Vocational Subject Areas

As already described, the high point for vocational enrollment was the late 1970s and enrollments have declined somewhat since that time. To understand in greater detail where the changes in vocational coursetaking have come, the vocational curriculum has been divided for analysis into three sub-curricula. They are Consumer and Homemaking Education (C&HE), General Labor Market Preparation (GLMP), and Specific Labor Market Preparation (SLMP). GLMP includes typing, industrial arts, career education, and English or math courses related to vocational education. The SLMP category has been further divided into each of the major occupational training programs,

such as business and office, trades and industries, marketing and distribution, health, etc. This section explores changes at both the subcurricular and occupational training levels.

Change at the subcurricular level: At the subcurricular level, the major changes in vocational participation over the past two decades were a substantial increase in occupationally specific training, and increases followed by declines in consumer and homemaking education and, especially, in general labor market preparation courses. The biggest change early in the period was in C&HE, which experienced a 44 percent increase in average credits between the class of 1969 and the classes of 1979-82 (Table 2-9). Although the average student in the classes of 1979-82 still took only .69 of a credit, the program underwent substantial expansion as total vocational enrollments grew. Credits in specific labor market preparation (SLMP) rose almost as rapidly--39.5 percent--in the same period, even though such courses already comprised more than half of all vocational coursetaking at the beginning of the period. Credits in GLMP rose 15.5 percent in this period.

After the late 1970s, enrollment in C&HE and GLMP declined, although the decline in C&HE was smaller. The decline was greatest in GLMP, where average credits declined 36.6 percent between the classes of 1979-82 and 1987. Interestingly, most of that decline came about prior to the academic reform movement of the mid 1980s. A great deal of the decline was in credits earned in career exploration courses. Participation in these courses appears to have risen in the mid to late 1970s and then declined rather rapidly (Table 2-10). In C&HE a smaller decline occurred (15 percent), so that overall credits remained higher in 1987 than at the end of the 1960s. In part, the smaller decline is also a reflection of the fact that C&HE lost little of its percentage share of all high school students--though the average C&HE participant enrolled in fewer courses (Table 2-11).

Table 2-9

Average Total Credits Completed by High School Graduates in Vocational Education and Average Credits by Vocational Sub-Curriculum, 1969-1987

Class(es) of	Total Vocational Credits*	Consumer and Homemaking Education (C&HE)	General Labor Market Preparation (GLMP)	Specific Labor Market Preparation (SLMP)
1969	3.67	0.48	1.10	2.10
1975-78	4.50	0.67	1.26	2.57
1979-82	4.89	0.69	1.27	2.93
1982	4.64	0.68	1.02	2.94
1987	4.44	0.60	0.93	2.90

* May not be the same as the total for the three subcurricula due to rounding.

Source: John Tuma et al., "Enrollment Trends in Vocational and Academic Education in American Public High Schools, 1969-1987," (Berkeley, CA: MPR Associates), 1989.

Table 2-10

Average Credits Completed by All Students in General Labor Market Preparation (GLMP), 1969-1987

Class(es) of	Total GLMP Credits	Typing	Introduction Industrial	Career Exploration	GLM Skills
All Students					
1969	1.10	0.54	0.12	0.31	0.13
1975-78	1.26	0.56	0.17	0.38	0.15
1979-82	1.27	0.55	0.16	0.41	0.16
1982	1.02	0.55	0.17	0.17	0.12
1987	0.93	0.55	0.14	0.14	0.10

Source: John Tuma et al., "Enrollment Trends in Vocational and Academic Education in American Public High Schools, 1969-1987," (Berkeley, CA: MPR Associates), 1989.

Table 2-11

Participation in the Consumer and Homemaking Education (C&HE) Curriculum, 1969-87

Class(es) of	Average C&HE Credits	Percentage of Students Participating	Average Credits of Participating Students Only
1969	0.48	31.76	1.51
1975-78	0.67	48.61	1.38
1979-82	0.69	51.80	1.33
1982	0.68	50.19	1.35
1987	0.60	47.18	1.27

Source: John Tuma et al., "Enrollment Trends in Vocational and Academic Education in American Public High Schools, 1969-1987," (Berkeley, CA: MPR Associates), 1989.

Despite the decline in overall vocational enrollment, average credits in SLMP experienced almost no decline in the 1980s.[24] As a result, SLMP accounted for a larger share of all vocational education at the end of the two-decade period (65 percent of all vocational credits) than it did at the beginning (57 percent). The next section explores enrollment changes in the SLMP program in greater detail.

Specific Labor Market Preparation (SLMP): The most striking finding about enrollment in SLMP occupational training subprograms is that participation increased rather steadily over most of the past two decades. Although there were slight declines in credits earned between the classes of 1982 and 1987, several fields showed no decline or even an increase in enrollment (Table 2-12).

[24] Only 1.4 percent from the class of 1982 to the class of 1987.

Further, the percentage of all high school students taking at least one course in SLMP continued to increase over the entire period--increasing from 72.34 percent of students in the class of 1969 to 88.52 percent in the class of 1987. (Table 2-13) Fields with increased enrollment over the two decades included health, occupational home economics, and technical/communications education (Table 2-12). The latter field included computer programming and computer science. Additionally, fields with little or no decline between the classes of 1969 and 1987 included agricultural education and marketing and distribution, although the latter appears to have experienced a slight decline in the early 1980s.

Only the two largest SLMP programs showed declines in enrollment in the period, and for one of those programs, the decline was small. The largest decline--23 percent--was in credits earned in trades and industries courses. That change was registered between the highest enrollment period--the classes of 1979-82 combined--and the class of 1987. The decline in business and office credits was considerably smaller (6.1 percent) and occurred between the classes of 1982 and 1987.[25] As a result, business and office (excluding typing) and trades and industries changed places with respect to relative enrollments, with business becoming the SLMP program with the greatest enrollment by the class of 1987.[26]

SLMP Course Sequences: Another way to understand changes in participation in SLMP is to observe the extent to which students take a sequence of related SLMP courses. Determining the extent of sequencing over time makes it possible to determine whether students' experiences in vocational education are haphazard, whether they dabble in a variety of fields rather than concentrating in one and learning it thoroughly. Based on the belief that students "dabble," taking

---

[25] This category does not include typing classes, but if those were added the decline would be even smaller over the period.

[26] See Table 1-13 for overall percentages, Class of 1987.

Table 2-12

Average Number of Credits Completed in Specific Labor Market Preparation Subjects, 1969-1987

Class(es) of	Total SLMP Credits	Agriculture Credits	Business Credits	Market/ Distrib. Credits	Health Credits	Occ. Home Economics Credits	T & I Credits	Tech./ Comm. Credits
1969	2.10	0.06	0.94	0.05	*	0.08	0.95	*
1975-78	2.57	0.15	0.95	0.13	0.04	0.12	0.99	0.09
1979-82	2.93	0.22	0.96	0.20	0.06	0.15	1.18	0.08
1982	2.94	0.21	1.03	0.16	0.05	0.17	1.07	0.11
1987	2.90	0.19	0.97	0.16	0.07	0.19	0.96	0.24

*Less than 0.01 credits.

Source: John Tuma et al., "Enrollment Trends in Vocational and Academic Education in American Public High Schools, 1969-1987," (Berkeley, CA: MPR Associates), 1989.

Table 2-13

Percentage of Graduates Participating in the Specific Labor Market Preparation (SLMP) Curriculum by Level of Coursework, 1969-1987

Class(es) of	Percentage of Students Taking Any SLMP	Percentage Taking Course in Sequence			
		First	Second or Later	First and/or Second	Specialty
1969	72.34	61.29	37.99	4.77	31.70
1975-78	82.66	72.58	31.13	13.09	24.23
1979-82	85.38	75.61	36.84	17.03	25.18
1982	86.73	79.12	46.95	--	22.77
1987	88.52	83.19	42.89	--	20.49

Source: John Tuma et al., "Enrollment Trends in Vocational and Academic Education in American Public High Schools, 1969-1987," (Berkeley, CA: MPR Associates), 1989.

only a single course in a multitude of fields, critics charge that vocational coursetaking does not enable students to acquire sufficient skills for work in any one field.

In fact, most SLMP credits are earned in courses that *are* the first in a sequence of occupational training, and the tendency to take first courses (rather than subsequent ones) has increased over time (Table 2-14).[27] For the class of 1969, the average student took 1.01 credits in first courses and .68 credits in a second or later course in a sequence. Between that class and the class of 1987, first-course participation accounted for almost all the increase in SLMP participation so

[27] The "first and/or second course" category was needed because the taxonomy could not be applied in comparable detail to all the data sets in question.

that by 1987 the typical student took 1.90 credits in the first course in a sequence but only .80 credits in second courses or greater.[28] Further, fewer credits were earned over time in specialty courses, a category that includes advanced courses as well as those that could not be classified within sequences. As a result, it does not appear that increases in overall SLMP participation have led to more logically sequenced pattern of coursetaking.

Table 2-14

Average Credits Completed in the SLMP Curriculum
by Level of Coursework, 1969-1987

Class(es) of	Total Average Credits: SLMP	Course in Sequence			
		First	Second or Later	First and/or Second	Specialty
1969	2.10	1.01	0.68	0.05	0.36
1975-78	2.57	1.50	0.48	0.28	0.31
1979-82	2.93	1.61	0.59	0.40	0.33
1982	2.94	1.77	0.92	--	0.26
1987	2.90	1.90	0.80	--	0.20

Source: John Tuma et al., "Enrollment Trends in Vocational and Academic Education in American Public High Schools, 1969-1987," (Berkeley, CA: MPR Associates), 1989.

On the other hand, coursetaking patterns in the last years of high school appeared more "focused" over time (Table 2-15). It was difficult to compare the data sets on this point, but while

[28] Some of the growth in first course participation is explained by an increasing overall number of students enrolling in SLMP over the period--but not all. As a result, it appears that students are somewhat less likely to complete a sequence over time. See MPR study, p.60 for details on increasing percentage of students enrolling in SLMP.

1982 and 1987 graduates took more first course SLMP overall, the mix of first to second courses was closer in the junior and senior years than was the case for the class of 1969.[29] This suggests that students in later classes were trying more fields during high school but were concentrating in a single field as much as was the case for the earliest class. In the most recent years for which data were available, they were concentrating later in high school--a point closer to entering the labor market.

Primary Vocational Field: For another perspective on field concentration, the data analysis isolated participation patterns in the field in which each student taking any SLMP completed the most vocational credits. This was called the primary vocational field. Over time, more students completed two or more vocational credits in their primary field (Table 2-16). While this seems reasonable given the increasing total credits in SLMP, it was also an indication of intensity of vocational participation, suggesting that more students in the class of 1987 took more specialized courses than all other classes except 1979-82, the years when overall vocational participation was greatest. It also suggests that students *were* making some effort to concentrate in a particular occupational specialty.

Summary: Overall, vocational coursetaking increased in the 1970s and declined slightly in the 1980s. Although increases took place in all parts of the vocational curriculum, most of the decline came in GLMP and, to a lesser extent, in C&HE participation. There has been almost no decline in participation in SLMP, except in trades and industries. With respect to systematic coursetaking and specialization within the SLMP, the data do not suggest a particular trend.

---

[29] The NLS-Youth data set does not yield data in a manner that can be used with the course taxonomy for this type of analysis and, hence, the NLS-Youth classes (1975-78 and 1979-82) are omitted from this analysis.

Table 2-15

Average Credits Completed in the SLMP Curriculum by Level of Coursework and Grade Level, 1969-1987

Class(es) and Grade Levels	Total SLMP	Courses in Sequence			
		First	Second or Later	First and/or Second	Specialty
1969					
9th Grade	0.20	0.17	*	0.01	0.02
10th Grade	0.39	0.29	0.04	*	0.05
11th Grade	0.77	0.37	0.31	0.01	0.09
12th Grade	0.75	0.18	0.32	0.02	0.22
1982					
9th Grade	0.29	0.24	0.02	--	0.02
10th Grade	0.49	0.35	0.10	--	0.04
11th Grade	0.99	0.61	0.30	--	0.08
12th Grade	1.15	0.55	0.49	--	0.11
1987					
9th Grade	0.23	0.20	0.01	--	0.01
10th Grade	0.38	0.27	0.09	--	0.02
11th Grade	0.79	0.56	0.18	--	0.05
12th Grade	1.01	0.55	0.38	--	0.08
Grade Unknown	0.49	0.32	0.14	--	0.04

* Less than 0.01 credits.

Source: John Tuma et al., "Enrollment Trends in Vocational and Academic Education in American Public High Schools, 1969-1987," (Berkeley, CA: MPR Associates), 1989.

Table 2-16

Percentage of Graduates Completing a Given Number of Credits in "Primary Vocational Fields", 1969 to 1987

Class(es) of	Number of Credits Completed							
	<2	2	3	4	5	6	7	8+
1969	45.6	20.9	13.8	10.9	3.1	4.1	1.4	0.2
1975-78	44.2	24.2	13.2	8.6	3.4	4.2	0.7	1.3
1979-82	35.8	24.0	16.8	9.5	5.0	6.0	1.7	1.3
1982	42.6	22.4	15.1	8.8	3.9	4.5	1.0	1.7
1987	37.6	24.9	15.9	10.1	3.8	5.0	1.3	1.4

Source: John Tuma et al., "Enrollment Trends in Vocational and Academic Education in American Public High Schools, 1969-1987," (Berkeley, CA: MPR Associates), 1989.

COURSETAKING PATTERNS OF STUDENT SUBGROUPS

The coursetaking patterns described so far are for the "average" student, but few real students are "average." To better understand the coursetaking patterns of real students, the data can be divided to describe how subgroups of students with different backgrounds and educational experiences organize their high school programs. This section combines the analyses of academic and vocational coursetaking to examine how particular subgroups of students choose among both sets of offerings in developing their high school programs, and how those choices have changed over time. The section is organized by subgroups: by gender, race/ethnicity, and high school grade point average. Two additional subgroup characteristics, students' postsecondary educational plans and parents' education are included in some data sets and are reported as available.

Gender and Coursetaking Patterns

Girls consistently took slightly more credits in high school than boys. Over time, girls' and boys' academic coursetaking patterns converged, but their vocational coursetaking patterns remained almost as different in the class of 1987 as they were in the class of 1969. As a result, girls and boys in the class of 1987 looked relatively alike with respect to overall and academic coursetaking but quite different with respect to high school occupational preparation.

Overall and academic coursetaking patterns: Girls took slightly more courses than boys throughout the roughly two decades included in the analysis, but increased their total credits slightly less than boys (Table 2-17). In the class of 1969, girls took an average of 20.68 credits compared to 20.21 credits for boys. In the class of 1987, girls took 2.21 credits more, or 22.89 on average, while

boys took 2.43 credits more, or 22.64 on average. As a result, boys' and girls' total credits have converged over time, by about .28 of a credit.[30]

Table 2-17

Average Total of Credits Completed by Male and Female High School Graduates, 1969-1987

Sex	Class(es) of:				
	1969	1975-1978	1979-1982	1982	1987
Male	20.21	20.61	21.10	21.32	22.64
Female	20.68	20.90	21.27	21.62	22.89

Source: John Tuma et al., "Enrollment Trends in Vocational and Academic Education in American Public High Schools, 1969-1987," (Berkeley, CA: MPR Associates), 1989.

Although total credits taken by boys and girls converged, girls overtook and passed boys in academic credits over the period (Table 2-18). In the class of 1969, girls and boys took virtually the same number of academic credits. By the class of 1987, however, girls took .70 of a credit more than boys, accelerating a trend that appears to have begun in the early 1970s. The gap widened between the classes of 1982 and 1987, with girls increasing their academic credits by 1.57 credits, while boys increased their academic coursetaking by 1.37 credits.[31]

There are some interesting differences in academic coursetaking patterns between boys and girls although, over time, convergence appears to be the trend. For example, although they started

[30] This was computed by estimating the expected female credits in 1987 based on the ratio of male to female credits in 1969. The estimated female credits were 23.17. In fact, females earned 22.89, a .28 difference.

[31] Black and Hispanic girls accumulate a greater number of academic credits than boys for the first time in the class of 1987.

Table 2-18

Average Number of Academic Credits Earned by Male and Female Public High School Graduates, 1969-1987

Class(es) of	Males	Females
1969	14.94	14.89
1975-78	13.89	14.02
1979-82	13.84	13.95
1982	13.91	14.41
1987	15.28	15.98

Source: John Tuma et al., "Enrollment Trends in Vocational and Academic Education in American Public High Schools, 1969-1987," (Berkeley, CA: MPR Associates), 1989.

with considerably fewer credits, the average number of credits earned by girls in mathematics and science declined little, if at all, in the 1970s (Tables 2-19 and 2-20). By the late 1970s, girls' average math credits were already on the upswing. Boys' math and science credits, on the other hand, declined throughout the 1970s although they rebounded in the 1980s. As a result, participation rates in math and science were virtually the same for girls and boys by the class of 1987.

Not only did math and science credits of boys and girls converge, but so did participation in sub-parts of the math and science curriculum. In mathematics, girls and boys took roughly similar amounts of courses called "basic" or "general" as well as algebra throughout the period (Table 2-21). Over time, however, girls improved their participation in applied mathematics, geometry, calculus and other advanced math courses, largely achieving parity with boys by the class of 1987. In science, girls took slightly greater amounts of biology throughout the two decades and achieved parity in

Table 2-19

Average Number of Credits Earned by Male and Female Public High School Students in Math and Science, 1969-1987

	Class(es) of:				
	1969	1975-1978	1979-1982	1982	1987
Mathematics					
Male	2.73	2.51	2.57	2.64	3.06
Female	2.23	2.21	2.31	2.47	2.97
Science					
Male	2.38	2.40	2.26	2.23	2.53
Female	2.10	2.14	2.11	2.11	2.43

Source: John Tuma et al., "Enrollment Trends in Vocational and Academic Education in American Public High Schools, 1969-1987," (Berkeley, CA: MPR Associates), 1989.

survey courses and chemistry by the class of 1987 (Table 2-22). Only in physics did girls' coursetaking continue to lag behind that of boys.

In English and social studies, unlike math and science, boys and girls maintained roughly similar rates of coursetaking throughout the two decades (Table 2-23). Boys began the period with slightly higher rates of coursetaking; both sexes took less English and social studies in the 1970s, and girls increased their coursetaking slightly more in the 1980s. As a result, girls took a bit more English and social studies by the class of 1987, but the gender differences are negligible. There appear to be few gender differences with respect to coursetaking in the sub-parts of the English and social studies curricula, although girls in the class of 1987 took slightly more English composition than boys (Table 2-24).

Table 2-20

Average Math and Science Credits Earned by
All Students, Males, and Females, 1969-1987

Class(es) of	Math	Science
1969		
All Students	2.47	2.23
Male	2.73	2.38
Female	2.23	2.10
1975-1978		
All Students	2.35	2.26
Male	2.51	2.40
Female	2.21	2.14
1979-1982		
All Students	2.44	2.18
Male	2.57	2.26
Female	2.31	2.11
1982		
All Students	2.35	2.17
Male	2.64	2.23
Female	2.47	2.11
1987		
All Students	3.02	2.51
Male	3.06	2.53
Female	2.97	2.43

Source: John Tuma et al., "Enrollment Trends in Vocational and Academic Education in American Public High Schools, 1969-1987," (Berkeley, CA: MPR Associates), 1989.

Table 2-21

Average Number of Credits Earned by Male and Female Public High School Graduates in Math Subjects, 1969-1987

Class(es) of	Basic Math	General Math	Applied Math	Pre-Algebra	Algebra	Geometry	Calculus	Advanced/ Other
1969								
Male	0.33	0.25	0.09	*	0.85	0.57	0.01	0.63
Female	0.31	0.21	0.01	*	0.79	0.48	*	0.43
1975-1978								
Male	0.17	0.45	0.08	0.09	0.64	0.50	0.03	0.55
Female	0.15	0.45	0.05	0.08	0.62	0.44	0.02	0.39
1979-1982								
Male	0.10	0.51	0.12	0.09	0.65	0.50	0.03	0.57
Female	0.08	0.45	0.09	0.09	0.68	0.47	0.03	0.44
1982								
Male	0.11	0.50	0.16	0.23	0.55	0.45	0.05	0.59
Female	0.08	0.40	0.12	0.25	0.59	0.46	0.04	0.54
1987								
Male	0.14	0.38	0.27	0.25	0.66	0.57	0.07	0.73
Female	0.12	0.30	0.24	0.26	0.68	0.59	0.05	0.73

* <0.01 credits.

Source: John Tuma et al., "Enrollment Trends in Vocational and Academic Education in American Public High Schools, 1969-1987," (Berkeley, CA: MPR Associates), 1989.

Table 2-22

Science Credits Earned by Male and Female High School Graduates, 1969-1987

Class(es) of	Science Survey	Biology	Chemistry	Physics
1969				
Male	0.92	0.88	0.42	0.16
Female	0.74	0.99	0.32	0.06
1975-1978				
Male	0.56	0.97	0.42	0.45
Female	0.51	0.99	0.35	0.29
1979-1982				
Male	0.57	0.86	0.37	0.46
Female	0.48	0.98	0.33	0.32
1982				
Male	0.78	0.89	0.35	0.21
Female	0.71	0.96	0.33	0.12
1987				
Male	0.78	1.04	0.47	0.25
Female	0.73	1.13	0.47	0.16

Source: John Tuma et al., "Enrollment Trends in Vocational and Academic Education in American Public High Schools, 1969-1987," (Berkeley, CA: MPR Associates), 1989.

Table 2-23

Social Studies and English Credits Earned
by Male and Female High School Graduates,
1969-1987

Class(es) of	All English Credits	All Social Studies Credits
1969		
All Students	4.07	3.39
Male	4.10	3.36
Female	4.05	3.42
1975-1978		
All Students	3.69	3.15
Male	3.71	3.18
Female	3.66	3.13
1979-1982		
All Students	3.76	3.12
Male	3.78	3.14
Female	3.75	3.10
1982		
All Students	3.87	3.16
Male	3.84	3.15
Female	3.90	3.17
1987		
All Students	4.00	3.31
Male	3.98	3.29
Female	4.02	3.33

Source: John Tuma et al., "Enrollment Trends in Vocational and Academic Education in American Public High Schools, 1969-1987," (Berkeley, CA: MPR Associates), 1989.

Table 2-24

English and Social Studies Sub-Curricula Credits Earned by Male and Female High School Graduates, 1969-1987

Class(es) of	Social Studies				English			
	American History	World History	American Government	Social Studies	English Survey	English Literature	English Composition	English Speech
1969								
Male	1.06	0.79	1.06	0.45	3.87	0.01	0.07	0.14
Female	1.04	0.84	1.08	0.46	3.80	0.02	0.09	0.14
1975-1978								
Male	1.11	0.56	0.52	1.00	2.89	0.44	0.23	0.15
Female	1.09	0.53	0.50	1.01	2.84	0.40	0.28	0.14
1979-1982								
Male	1.11	0.53	0.51	0.99	2.90	0.42	0.29	0.17
Female	1.10	0.51	0.50	0.99	2.83	0.43	0.34	0.16
1982								
Male	1.04	0.41	0.55	1.16	2.93	0.51	0.27	0.13
Female	1.02	0.42	0.53	1.21	2.92	0.53	0.32	0.14
1987								
Male	1.11	0.46	0.62	1.10	3.37	0.30	0.18	0.13
Female	1.12	0.45	0.62	1.15	3.32	0.33	0.24	0.13

Source: John Tuma et al., "Enrollment Trends in Vocational and Academic Education in American Public High Schools, 1969-1987," (Berkeley, CA: MPR Associates), 1989.

Girls took more fine arts and foreign language throughout the two decades but foreign language coursetaking rates for both boys and girls dropped substantially in the mid 1970s (Table 2-25). In fact, the decline in foreign language coursetaking accounts for much of the *overall* decline in academic coursetaking for girls, or .76 out of a total .94 credit decline between the class of 1969 and the classes of 1979-82. For boys, the 1969 to 1979-82 overall decline of one credit is highest in foreign language (.56) but is also spread among several other subjects. Boys increased their fine arts participation throughout the 1970s.

Observing foreign language participation by boys and girls in greater detail, the data reveal that foreign language participation in the class of 1987 remained lower for both sexes than in the class of 1969 (Table 2-26). Nonetheless, both sexes took Spanish at higher rates in 1987 than in 1969, although girls' Spanish participation rate rebounded to a greater degree than that of boys. Neither sex rebounded much in French coursetaking, and Latin and German participation rates showed little improvement from their low points for either sex.

In general, then, overall and academic coursetaking for boys and girls converged over time. Though there were a few important differences in the pace and timing of change, boys and girls were both taking more academic credits in the class of 1987 than in any class since 1969. Of greater significance, in math and science, where girls traditionally took less coursework than boys, girls improved more than boys overall. They also began to achieve parity with boys in college-preparatory and advanced math and science courses. Only in physics did they continue to lag somewhat behind boys in average credits earned.

Vocational Coursetaking Patterns: Unlike the pattern in academic coursetaking, gender differences in coursetaking were and remain the norm in vocational education. Over the two decades spanned by these data sets there was little, if any, convergence in male and female vocational coursetaking patterns. Although total credits taken by girls and boys were roughly similar, that

Table 2-25

Fine Arts and Foreign Language Credits Earned by
Male and Female High School Graduates, 1969-1987

Class(es) of	All Fine Arts Credits	All Foreign Language Credits
1969		
All Students	1.17	1.57
Male	0.99	1.38
Female	1.32	1.77
1975-1978		
All Students	1.40	1.11
Male	1.14	0.94
Female	1.62	1.26
1979-1982		
All Students	1.47	0.92
Male	1.27	0.82
Female	1.67	1.01
1982		
All Students	1.46	0.97
Male	1.28	0.78
Female	1.62	1.14
1987		
All Students	1.42	1.36
Male	1.24	1.16
Female	1.60	1.55

Source: John Tuma et al., "Enrollment Trends in Vocational and Academic Education in American Public High Schools, 1969-1987," (Berkeley, CA: MPR Associates), 1989.

Table 2-26

Average Number of Credits Earned by Male and Female High School Graduates in Foreign Languages, 1969 to 1987

Class(es) of	Foreign Language Year 1	Foreign Language Year 2	Foreign Language Year 3 or More	French	Spanish	Latin	German
1969							
Male	0.72	0.46	0.20	0.42	0.57	0.17	0.19
Female	0.85	0.58	0.34	0.76	0.64	0.19	0.14
1975-1978							
Male	0.47	0.30	0.14	0.22	0.50	0.06	0.15
Female	0.60	0.38	0.24	0.44	0.60	0.05	0.14
1979-1982							
Male	0.41	0.24	0.13	0.17	0.45	0.04	0.15
Female	0.50	0.30	0.18	0.36	0.49	0.04	0.10
1982							
Male	0.41	0.24	0.13	0.21	0.42	0.04	0.08
Female	0.55	0.35	0.24	0.36	0.59	0.06	0.10
1987							
Male	0.55	0.37	0.14	0.30	0.60	0.06	0.12
Female	0.72	0.48	0.20	0.51	0.79	0.07	0.09

* < 0.01 credits.

Source: John Tuma et al., "Enrollment Trends in Vocational and Academic Education in American Public High Schools, 1969-1987," (Berkeley, CA: MPR Associates), 1989.

similarity masked fundamental differences in course choices. The transcript analysis performed for the NAVE was the first large-scale opportunity, using valid and reliable information, to examine gender-based vocational enrollment patterns and trace their change over time. Its results are not encouraging for those who seek greater convergence in the vocational coursetaking pattern of boys and girls.

With respect to total credits, girls began the period earning more vocational credits than boys and continued to do so as vocational enrollments climbed. As enrollments began to drop, however, enrollments of girls dropped faster than those of boys so that girls ended the period earning fewer average vocational credits than boys. Girls in the class of 1969 earned 3.92 vocational credits, considerably more than the average 3.37 credits earned by boys (Table 2-27). Girls' enrollment climbed to an average of 5.0 credits for the classes of 1979-82, then declined to 4.36 in the class of 1987, a 14.7 percent decline in credits. Boys earned fewer vocational credits at their height (4.77 credits on average for the classes of 1979-82) and their enrollment declined by only a small amount--to 4.52 credits by the class of 1987. Almost all boys and girls (98 percent of each) continued to enroll in some vocational education in the class of 1987.

Examining the three vocational subcurricula, however, there were substantial differences in participation by sex. Enrollment in Consumer and Homemaking Education (C&HE) was dominated by girls throughout the two decades (see Table 2-27). Although the C&HE enrollment of boys increased over time, it was still only .33 of a credit on average at the end of the period, while girls earned .86 of a credit on average. Nonetheless, .86 was a decline from the 1.07 average credits in C&HE earned by girls in 1979-82.

Except for industrial arts which was taken almost exclusively by boys, girls also dominated General Labor Market Preparation (GLMP). They were the bulk of participants in typing, career exploration, and general skills training throughout the period. Because their enrollment in GLMP

Table 2-27

Average Number of Vocational Education Credits Earned by Male and Female High School Graduates: Total, C&HE, GLMP Subjects, and SLMP, 1969-1987

Class(es) of	Consumer and Home Economics (C&HE)	Total	Typing	Introductory Industrial	Career Experience	GLMP Skills	SLMP	Total Vocational Credits
Males								
1969	0.05	0.91	0.37	0.23	0.21	0.10	2.41	3.37
1975-1978	0.21	1.11	0.36	0.34	0.31	0.11	3.02	4.34
1979-1982	0.30	1.15	0.35	0.28	0.39	0.13	3.33	4.77
1982	0.31	0.96	0.37	0.31	0.19	0.09	3.36	4.63
1987	0.33	0.90	0.43	0.25	0.14	0.08	3.29	4.52
Females								
1969	0.88	1.23	0.70	0.01	0.36	0.16	1.81	3.92
1975-1978	1.06	1.40	0.74	0.02	0.45	0.19	2.18	4.64
1979-1982	1.07	1.38	0.74	0.04	0.42	0.18	2.55	5.00
1982	1.03	1.07	0.71	0.04	0.16	0.15	2.56	4.66
1987	0.86	0.95	0.66	0.03	0.14	0.12	2.55	4.36

Source: John Tuma et al., "Enrollment Trends in Vocational and Academic Education in American Public High Schools, 1969-1987," (Berkeley, CA: MPR Associates), 1989.

declined more rapidly than that of boys after the mid 1970s, however, girls and boys had roughly equivalent total GLMP credits in the class of 1987, as well as credits in most of the subparts of GLMP. Boys' enrollment in typing increased over the two decades.

It is in the SLMP part of the curriculum that critics tend to focus on sex segregation in vocational education. Throughout the period, boys took more Specific Labor Market Preparation (SLMP) courses and girls' SLMP participation was concentrated in one field--business (Table 2-28). On average, boys took 2.41 credits in SLMP in the class of 1969, rising to an average of 3.36 credits in the classes of 1982 and declining little since that time. Girls' enrollment rose in much the same manner, beginning at an average 1.81 credits, rising to 2.56 in the class of 1982 and remaining steady. The difference in average credits was, in part, a difference in total enrollments. Somewhat more boys (91 percent) than girls (86 percent) took at least one SLMP course.

Beyond total credits, however, any similarities between boys' and girls' SLMP participation ends. Boys dominated agricultural education, where their credits outnumbered those of girls about 4.5 to one in the class of 1987, a rate that changed little over the period. Contrary to popular belief about decline in enrollment in this program, boys' credits in agricultural education tripled between the classes of 1969 and 1982, although the average increase was only around a fourth of a credit.[32] By contrast, the relative rate of female enrollment in agricultural education declined since the mid 1970s, both in average credits earned and in the percentage of girls taking any agriculture courses.

Boys also dominated trades and industries, including construction, mechanics and repair, and precision production, where relative enrollments of males and females changed little over time. Boys in the class of 1969 took an average of 1.81 credits in T&I; by the classes of 1979-82 that average

---

[32] Expansion in agriculture credits may be due, in part, to the development of new programs under this rubric including horticulture and landscape management.

Table 2-28

Average Number of Credits Earned by Male and Female High School Graduates in Different SLMP Subjects (1969-1987)

Class(es) of	All SLMP	Agriculture	Business Management	Business Support	Marketing Distribution	Health	Occupational Home Economics	Construction	Mechanics & Repair	Precision Production	Technical/ Communication
Males											
1969	2.41	0.12	0.18	0.21	0.04	*	0.04	0.09	0.24	1.48	*
1975-1978	3.02	0.26	0.20	0.21	0.15	0.01	0.05	0.23	0.45	1.19	0.11
1979-1982	3.33	0.35	0.18	0.22	0.17	0.01	0.06	0.30	0.59	1.21	0.09
1982	3.36	0.36	0.18	0.29	0.14	0.02	0.05	0.27	0.52	1.20	0.14
1987	3.29	0.33	0.16	0.41	0.13	0.02	0.08	0.21	0.43	1.09	0.29
Females											
1969	1.81	0.02	0.21	1.26	0.06	0.01	0.12	*	0.01	0.12	*
1975-1978	2.18	0.06	0.24	1.19	0.12	0.08	0.17	*	0.03	0.13	0.07
1979-1982	2.55	0.09	0.24	1.26	0.23	0.11	0.24	0.01	0.02	0.17	0.07
1982	2.56	0.08	0.26	1.29	0.18	0.07	0.29	0.01	0.02	0.17	0.08
1987	2.55	0.07	0.21	1.14	0.19	0.12	0.29	0.01	0.02	0.20	0.18

* Less than 0.01 credits.

Source: John Tuma et al., "Enrollment Trends in Vocational and Academic Education in American Public High Schools, 1969-1987," (Berkeley, CA: MPR Associates), 1989.

had risen to 2.10 credits. It dropped since then, however, to 1.73 credits, its lowest level during the period under examination. Throughout the period, the heaviest male T&I enrollment came in precision production, although enrollment in that field also dropped over the period, from 1.48 average credits in 1969 to 1.09 in 1987.

Girls' participation in trades and industries remained low with almost no increase in participation over the period under examination. Very few girls took any credits in construction at any point in time over the two decades and girls' participation in mechanics and repair actually declined after the mid-1970s (Table 2-29). Relative female participation in precision production improved somewhat, from a low of 10 boys to one girl in the class of 1969, to a rate of 4 to 1 in the class of 1987, but most of the improvement was due to the declining enrollment of boys. Girls' absolute participation rate and average credits in precision production have changed little since the late 1970s.

Girls' participation in female dominated programs has also changed little over the two decades. Girls were most likely to enroll in business support courses throughout the period, although over time they earned fewer of their SLMP credits in that program (Table 2-30). For girls, average credits in business support were fairly steady from the class of 1969 through the class of 1982 at around one and a quarter credits. They dropped for the first time--to 1.14 credits--with the class of 1987. Most of the overall increase in female SLMP participation occurred in other traditionally female fields, notably occupational home economics and, to a lesser extent, health. Girls' credits also increased in technical/communications, however, a field with a greater share of male participants.

To the extent that vocational education became less sex segregated at all, it occurred because of the development of the technical/communications field and because boys earned more credits in one traditionally female field. Boys' credits in business support doubled over the period under examination, with most of the change occurring in the 1980s, while girls' business support credits

Table 2-29

Percentage of Male and Female High School Graduates Who Enrolled in Agriculture, Construction, Precision Production, and Mechanics and Repairs Courses, 1969-1987

Vocational Program	Percentage of Class(es) of: 1969	1975-1978	1979-1982	1982	1987
Agriculture					
Male	5.40	10.43	15.78	13.75	12.54
Female	1.77	4.41	5.42	5.10	3.81
Construction					
Male	2.96	10.12	12.95	13.09	9.93
Female	.04	.34	.59	.81	.47
Precision Production					
Male	59.06	53.07	53.51	51.52	52.36
Female	5.90	10.65	12.52	13.54	13.79
Mechanics and Repair					
Male	11.66	26.05	26.70	22.79	20.19
Female	.34	3.32	2.78	1.81	1.58

Source: Unpublished data supplied by MPR Associates.

dropped slightly.[33] Like girls, boys earned progressively more credits in the technical/communications area, with the sharpest increase in the 1980s as well. Nonetheless, there were only a few programs--marketing, business management, technical/communications--where the participation rates of, or credits earned by, boys and girls even began to approach parity (see Table 2-30).

[33] The percentages of boys taking some coursework in health and occupational home economics increased, but the totals remain minuscule.

Table 2-30

Percentage of Male and Female High School Graduates Who Enrolled in Business Management, Business Support, Occupational Home Economics, Health, and Technical/ Communications Courses, High School Classes of 1969-1987

Vocational Program	Percentage of Class(es) of:				
	1969	1975-1978	1979-1982	1982	1987
Business Management					
Male	19.13	22.45	21.26	20.38	18.76
Female	21.84	26.02	26.44	25.71	23.46
Business Support					
Male	18.46	20.29	21.73	26.60	32.94
Female	56.12	54.71	57.23	58.11	58.10
Marketing and Distrib.					
Male	3.75	8.80	8.64	8.08	7.39
Female	5.23	7.10	10.63	8.88	9.93
Occ. Home Economics					
Male	1.20	3.47	3.92	4.33	5.22
Female	4.36	11.92	14.53	16.77	15.60
Health					
Male	.0	.60	.54	1.55	2.75
Female	.59	2.89	5.58	4.04	6.93
Technical and Commun.					
Male	.30	14.43	15.08	15.10	28.11
Female	.34	12.09	11.26	10.78	21.35

Source: Unpublished data supplied by MPR Associates.

Vocational/Academic Tradeoffs: Finally, there were few differences between girls and boys with respect to changes in their mix of academic and vocational coursetaking over time. Girls appeared to make slightly more of a trade off between academic and vocational coursetaking than boys, in that for girls, an increase in credits earned in one was almost always accompanied by a commensurate decrease in credits earned in the other. But these differences between the sexes were not large.

Race/Ethnicity and Coursetaking Patterns

The longitudinal youth data sets did not all classify students using precisely the same set of race and ethnic descriptors. As a result, race and ethnic group coursetaking information is not always parallel across the high school classes. In particular, data for Asians and Native Americans are not identified in some of the data sets and not all students in the class of 1969 were classified by ethnicity. With these caveats, the discussion turns to the analysis of coursetaking patterns by race and ethnicity.

Total and Academic Credits: Between the classes of 1969 and 1987, all ethnic/racial groups of high school graduates increased their average total high school credits (Table 2-31). Further, the relative differences among groups appeared to narrow over time. As the largest group, the pattern for whites was much like the overall patterns described earlier. Whites experienced the largest gain in credits over the period--from 20.30 in the class of 1969, to 22.91 in the class of 1987. Hispanics began the period with considerably higher average credits than whites (21.77) but ended the period with slightly lower average credits (22.53). Blacks also completed high school with more credits than whites in the class of 1969 (20.73), but completed fewer credits than whites by the class of 1987 (22.14).

Table 2-31

Total Credits Earned by High School Graduates by Race/Ethnicity, 1969-1987

	Percentage of Class(es) of:				
	1969	1975-1978	1979-1982	1982	1987
Racial/Ethnic Group					
Asian	22.87	--	--	22.13	23.82
Black	20.73	20.28	20.59	21.24	22.14
Hispanic	21.77	21.31	21.36	21.17	22.53
Native American	--	--	--	21.42	23.15
White	20.30	20.80	21.28	21.55	22.91

Source: John Tuma et al., "Enrollment Trends in Vocational and Academic Education in American Public High Schools, 1969-1987," (Berkeley, CA: MPR Associates), 1989.

Asians had the greatest average credits in each time period for which data on Asians were available. In the class of 1969, they completed, on average, 2.5 credits more than white students and one credit more than Hispanics. Although their average credits in the class of 1982 appeared to decline slightly, their coursetaking rebounded and they completed almost a credit more than whites in the class of 1987. Overall, however, the total credits of whites and Asians became more similar over time, as the total credits for whites improved more rapidly.

In general, ethnic/racial differences in academic coursetaking also narrowed although the relative positions of groups changed little. The absolute credit differences between Asians and all others actually widened over the period (Table 2-32). In the class of 1969, whites took an average of 15.22 academic credits, while Asians took 15.86. Blacks and Hispanics had average academic participation almost 2 credits lower than that of whites--13.53 and 13.45 credits respectively. By the class of 1982, the academic coursetaking of whites and Hispanics had declined, whites to 14.43 credits and Hispanics to 12.94 credits, but those of blacks and Asians increased slightly. In the 1980s, both whites and blacks increased their participation in academic courses by over a credit, to

Table 2-32

Academic, Vocational, and Personal/Other Credits Earned by High School Graduates by Race/Ethnicity, 1969-1987

Racial/Ethnic Group	Class of 1969			Class of 1982			Class of 1987		
	Academic	Vocational	Personal/ Other	Academic	Vocational	Personal/ Other	Academic	Vocational	Personal/ Other
White	15.22	3.38	1.70	14.43	4.54	2.58	15.71	4.52	2.68
Asian	15.68	3.77	3.42	15.89	3.14	3.10	17.83	2.92	3.07
Black	13.53	4.76	2.44	13.73	4.83	2.68	14.96	4.47	2.71
Hispanic	13.45	5.10	3.22	12.94	5.27	2.96	15.01	4.29	3.24
Native American	n/a	n/a	n/a	13.35	5.11	2.96	14.42	4.70	4.03

Source: John Tuma et al., "Enrollment Trends in Vocational and Academic Education in American Public High Schools, 1969-1987," (Berkeley, CA: MPR Associates), 1989.

15.71 and 14.96 respectively. At the same time, Asians increased their academic coursetaking by two credits--so that by the class of 1987, the average Asian high school graduate completed over two credits more in academic subjects than the average white graduate. Hispanics also increased their academic coursetaking dramatically--by over two credits, to 15.01. As a result, academic credits of all groups but Asians converged and were grouped closely by the class of 1987.

Within the academic curriculum, there were ethnic/racial differences in coursetaking patterns, differences that also decreased for most groups over the period (Table 2-33). Asians consistently enrolled in more mathematics, science and foreign language than any other group, however, and the differences did not decrease over time. In fact, the differences in science and foreign language participation between Asians and others increased. Throughout the period, Asians enrolled in between a half and two-thirds of a credit more mathematics than whites, the group with the next highest average number of math credits. In the class of 1987, for example, Asians took an average of 3.70 math credits while whites took 3.03 credits. In the class of 1969, Asians took only slightly more science (2.38 credits) than whites (2.28 credits). By the class of 1987, however, Asians enrolled in 3.0 science credits while whites enrolled in 2.57 credits. Asians enrolled in a half credit more foreign language than any other group in the class of 1969. By the class of 1987, Asians were enrolling in a credit more than Hispanics, the next closest group in foreign language participation.

For groups other than Asians, academic coursetaking tended to converge over time. In the class of 1969, blacks took an average of 2.19 math credits and whites 2.52 credits. By the class of 1987, however, blacks had achieved virtual parity with whites, taking an average of 2.96 credits in math, compared with 3.03 credits for whites. Other groups showed similar gains. Blacks, Asians and Native Americans took slightly more English than whites in the class of 1987. In fact, whites participated less in English, social studies, and (especially) foreign language in the class of 1987 than they did in the class of 1969.

Table 2-33

Academic Coursetaking of High School Graduates for Ethnic/Racial Groups, Credits Earned by Subject Area, 1969-1987

Racial/Ethnic Group	Class of 1969				Class of 1982				Class of 1987			
	Math	Science	English	Social Studies	Math	Science	English	Social Studies	Math	Science	English	Social Studies
White	2.52	2.28	4.15	3.43	2.60	2.25	3.84	3.20	3.03	2.57	4.01	3.29
Asian	3.12	2.38	3.80	3.19	3.14	2.57	3.81	3.17	3.70	3.00	4.03	3.46
Black	2.19	2.20	3.80	3.26	2.55	2.04	4.07	3.11	2.96	2.31	4.09	3.32
Hispanic	2.22	2.01	3.49	2.97	2.24	1.78	3.87	3.00	2.86	2.20	3.94	3.19
Native American	n/a	n/a	n/a	n/a	2.09	1.96	3.94	3.24	3.06	2.44	4.03	3.19

Racial/Ethnic Group	Class of 1969		Class of 1982		Class of 1987	
	Fine Arts	Foreign Language	Fine Arts	Foreign Language	Fine Arts	Foreign Language
White	1.13	1.71	1.51	1.03	1.47	1.35
Asian	1.03	2.16	1.33	1.87	1.16	2.48
Black	1.31	.95	1.25	.71	1.19	1.09
Hispanic	1.69	1.07	1.30	.75	1.33	1.48
Native American	n/a	n/a	1.69	.43	1.69	.75

Source: John Tuma et al., "Enrollment Trends in Vocational and Academic Education in American Public High Schools, 1969-1987," (Berkeley, CA: MPR Associates), 1989.

Vocational Coursetaking: There were also ethnic/racial differences in rates of vocational coursetaking although the trends for groups other than Asians were similar. With the exception of Asians, vocational participation was higher among minority groups than among whites throughout the period but the differences decreased over time (Table 2-34). In the class of 1969, Hispanics took an average of 5.10 vocational credits, blacks took 4.76 credits, and whites took 3.38 credits. Over time, the participation of whites increased faster than that of other groups, so that in the class of 1982 all three groups were considerably closer, although Hispanics continued to enroll in the largest number of vocational credits. The overall closeness among most ethnic/racial groups continued in the class of 1987, although the participation of Hispanics dropped by a full credit.[34] Unlike other groups, Asians took more vocational education in the class of 1969 than they completed in any subsequent period, and their vocational coursetaking dropped by .85 of a credit to 2.92 credits by the class of 1987. As a result, they took 1.5 credits less in vocational education than did whites in that class.

For most ethnic groups, the mix of vocational courses from among the three subcurricula (C&HE, GLMP, SLMP) also converged over time and GLMP coursetaking declined (Table 2-34). Blacks, Hispanics and Asians began the period taking at least a half credit more GLMP than whites, but the rate of course participation for all groups except whites decreased overtime, so that by the class of 1987 most groups took slightly less than a credit in GLMP.[35] At the same time, SLMP course participation increased substantially for whites and slightly for blacks. It increased and then decreased for Hispanics. The result is that all three groups took roughly similar amounts of SLMP in the class of 1987. Asians, on the other hand, took about the same amount of SLMP as whites in the

---

[34] Native Americans took 5.11 credits in vocational education in the class of 1982 and their participation also declined (to 4.70 credits) in the class of 1987. Much of the Hispanic decline was registered by girls whose C&HE coursetaking declined over the period.

[35] Asian coursetaking is somewhat lower at .71 of a credit.

Table 2-34

Total Vocational and Subcurriculum Vocational Participation of High School Graduates by Race/Ethnicity, 1969-1987

Race/Ethnic Group	Total Vocational Credits Class of		
	1969	1982	1987
White	3.38	4.54	4.52
Asian	3.77	3.14	2.92
Black	4.76	4.83	4.47
Hispanic	5.10	5.27	4.29
Native American	n/a	5.11	4.70

Race/Ethnic Group	Class of 1969			Class of 1982			Class of 1987		
	CHE	GLMP	SLMP	CHE	GLMP	SLMP	CHE	GLMP	SLMP
White	.44	.95	1.99	.63	.99	2.91	.60	.94	2.99
Asian	.22	1.55	2.00	.29	.92	1.94	.35	.71	1.86
Black	.70	1.55	2.51	.92	1.04	2.87	.73	.98	2.77
Hispanic	.42	1.90	2.78	.87	1.15	3.26	.61	.98	2.71
Native American	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

Source: John Tuma et al., "Enrollment Trends in Vocational and Academic Education in American Public High Schools, 1969-1987," (Berkeley, CA: MPR Associates), 1989.

class of 1969, but their participation did not increase over time, so that by the class of 1987 Asians took about a credit less SLMP than any other ethnic group.

Consumer and homemaking education coursetaking patterns also converge for all groups but Asians. Blacks in the class of 1969 took considerably more C&HE than other groups (.70 of a credit) and Asians took less (.22 of a credit). Hispanics took .42 of a credit on average, but doubled their C&HE coursetaking to .87 by the class of 1982. By the class of 1987, however, Hispanic credits in C&HE had declined and all three groups--whites, blacks, and Hispanics--were taking between .60 and .73 of a credit. Asians, on the other hand, continued throughout the period to take less C&HE than other groups, and completed an average of .35 of a credit in the class of 1987 (their highest level of C&HE participation).

Within the GLMP, all ethnic groups took about the same amount of typing but participation in the rest of the GLMP differed (Table 2-35). Since the class of 1969, all groups have taken roughly equal amounts of typing (from .50 to .65 of a credit). Other parts of the GLMP have experienced substantial declines for some groups. For example, Hispanics took an average of 1.09 credits in career exploration in the class of 1969, but their participation dropped to .25 of a credit by the class of 1987. Nonetheless, they continued to take slightly more career exploration than any other group. Black and Asian participation in career exploration also dropped rapidly over the period although it was not quite as high at the outset. Whites took considerably less career exploration in most time periods, but slightly more industrial arts than other groups. While most groups took small amounts of GLMP courses other than typing by the class of 1987, Asians took little else in the GLMP.

Within the SLMP, ethnic/racial groups show different levels of participation in subprograms over time. Like students as a whole, whites participate most heavily in business and T&I, but the increase in SLMP participation by whites over time occurs primarily in other fields--agriculture, occupational home economics, and technical/communications. Blacks take business courses most heavily, but black participation in T&I declines over the time period and especially in the 1980s.

Table 2-35

Average Credits Completed in the GLMP Curriculum by High School Graduates, by Race/Ethnicity, 1969-1987

Race/Ethnic Group	Total GLMP Credits	Typing	Introductory Industrial	Career Exploration	GLM Skills
Asian					
1969	1.55	0.65	*	0.80	0.10
1982	0.92	0.50	0.11	0.25	0.06
1987	0.71	0.51	0.04	0.11	0.05
Black					
1969	1.55	0.63	0.04	0.74	0.14
1975-78+	1.23	0.52	0.11	0.36	0.23
1979-82+	1.32	0.50	0.11	0.48	0.24
1982	1.04	0.55	0.13	0.26	0.11
1987	0.98	0.52	0.13	0.20	0.12
Hispanic					
1969	1.90	0.64	0.01	1.09	0.15
1975-78+	1.46	0.61	0.10	0.63	0.13
1979-82+	1.61	0.57	0.10	0.83	0.11
1982	1.15	0.50	0.25	0.27	0.13
1987	0.98	0.56	0.11	0.25	0.05
White					
1969	0.95	0.51	0.14	0.17	0.13
1975-78+	1.26	0.57	0.18	0.37	0.14
1979-82+	1.24	0.56	0.17	0.37	0.14
1982	0.99	0.56	0.17	0.14	0.12
1987	0.94	0.57	0.15	0.12	0.10

* Less than 0.01 credits.

+ Definitions of these groups in the NLS-Youth Data Set differed somewhat from those used in the other data sets.

Source: John Tuma et al., "Enrollment Trends in Vocational and Academic Education in American Public High Schools, 1969-1987," (Berkeley, CA: MPR Associates), 1989.

On the other hand, black enrollments in occupational home economics and health are the highest of any group, though black participation in occupational home economics may have peaked in the late 1970s. For Hispanics, declines in T&I enrollment appear to be the greatest of any group other than Asians, although T&I participation fluctuates over time. There are few clear trends in the participation of Hispanics over time within the SLMP, save a stable rate of participation in business. Hispanic participation in agriculture shows a substantial increase in the class of 1982 followed by an even greater decrease by the class of 1987.

Finally, the overall Asian decline in SLMP appeared to be primarily limited to a decline in T&I participation. The Asian participation rate in T&I fell from 1.19 credits in the class of 1969 to .44 of a credit by the class of 1987. Although Asians took fewer business courses than other groups, their participation was steady. Asian participation increased over time in all other fields except agriculture. In marketing and distribution it was roughly equal to that of other groups in the class of 1987. It rose substantially in technical/communications in both the classes of 1982 and 1987. In 1987, Asian participation in technical and communications was the highest of any group (.29 of a credit).

Vocational/Academic Tradeoffs: For ethnic/racial groups, changes in academic and vocational coursetaking over time did not point to many direct tradeoffs between participation in the two sets of courses. There were only a few cases in which declines in one field were roughly parallel to increases in the other. Those cases include, however, the decline in academic and increase in vocational coursetaking for whites in the period from the class of 1969 to the class of 1982--a change that affected a substantial amount of enrollment in absolute terms. In that instance, a .79 credit decline in academic coursetaking was accompanied by a 1.16 increase in vocational coursetaking.[36] No other set of changes of comparable magnitude were found in the data although increases in academic coursetaking by Hispanics and Native Americans between the classes of 1982 and 1987 were accompanied by declines in vocational coursetaking of roughly half the magnitude of the

[36] It was also accompanied by a .88 increase in personal/other courses.

academic increases. In general, when viewed by ethnic group, increases in academic coursetaking did not appear to be accompanied by declines in vocational coursetaking of comparable magnitude.

High School Achievement and Coursetaking Patterns

The increasing similarity, over time, in the coursetaking patterns of most ethnic groups did not occur for higher and lower achieving students. In contrast, differences in academic and vocational coursetaking patterns of higher and lower achieving students actually appeared to widen slightly in the 1980s. Higher and lower achieving students continued to take divergent curricula, a disturbing finding in light of the academic reform movement of the past decade. The following categories of student achievement were used in the analysis:

Mostly A = high school grade point average (GPA) of 3.3 or greater
Mostly B = GPA of 2.6-3.29
Mostly C = GPA of 1.6-2.59
Below C = GPA of 1.59 or less

With respect to overall credits earned in high school, high and low achieving students earned different amounts, and the gaps between the groups changed little over time (Table 2-36). In the class of 1969, the typical "below C" student took 18.57 credits, or about 85 percent of the credits taken by the typical "mostly A" student. The typical "mostly C" student took about 91 percent of the credits of the typical "mostly A" student. There was some convergence of credits in the mid 1970s, as low achieving student took more credits and high achieving students took slightly fewer credits. By the class of 1982, however, the gap was beginning to widen once more, and by the class of 1987 the differences were again similar to those of 1969. In the class of 1987, "mostly C" students were taking 91 percent the credits of "mostly A" students, while "below C" students were taking 83 percent of the credits of mostly A students.

The divergence in academic coursetaking is much greater than the divergence in overall credits (Table 2-37). In the class of 1969, "below C" students took only 12.74 academic credits, or 71 percent the academic credits of "mostly A" students, and "mostly C" students took 13.75 academic credits or 76 percent that of "mostly A" students. During the 1970s and early 1980s, the main trend

Table 2-36

Total Credits Earned by High School Graduates by High School Grade Point Average (GPA), 1969-1987

	Class(es) of:				
	1969	1975-1978	1979-1982	1982	1987
HS GPA					
Mostly As	21.81	21.60	22.15	22.54	24.39
Mostly Bs	21.20	21.12	21.78	21.95	23.51
Mostly Cs	19.82	20.23	20.59	21.00	22.09
Below C	18.57	19.76	19.46	19.62	20.18

Source: John Tuma et al., "Enrollment Trends in Vocational and Academic Education in American Public High Schools, 1969-1987," (Berkeley, CA: MPR Associates), 1989.

was a larger decline in academic coursetaking by higher achieving students than by low achieving students. As a result, in the class of 1982, "below C" students took 12.13 academic credits or 77 percent of the 15.82 average academic credits of "mostly A" students. In the 1980s, however, the academic credit gap between the highest and lowest achieving high school graduates widened again as "mostly A" and "mostly B" students took considerably more academic instruction. Between the classes of 1982 and 1987, "mostly A" and "mostly B" students increased their academic coursetaking substantially, "mostly A" students by 3 credits and "mostly B" students by 2.8 credits, while "mostly C students" increased their academic coursetaking by 1.73 credits and "below C" students increased their academic credits by only .72 of a credit.

The result was that the divergence in academic credits by higher and lower achieving students was slightly greater for the class of 1987 than it was for the class of 1969 and greater than it was at the start of the 1980s. The relationships between "mostly A" students and their "mostly B" and "mostly C" colleagues are almost identical in the classes of 1969 and 1987. The "below C" students in the class of 1987 took only 68 percent of the academic credits of their "mostly A" classmates as compared with 76 percent in the class of 1982.

Table 2-37

High School Academic Credits for High School Graduates
by GPA, 1969-1987

	Class(es) of:				
	1969	1975-1978	1979-1982	1982	1987
HS Grades					
Mostly As	18.01	15.86	16.07	15.82	18.80
Mostly Bs	15.82	14.31	14.67	13.81	16.61
Mostly Cs	13.75	12.92	12.74	12.64	14.37
Below C	12.74	12.66	11.78	12.13	12.85

Source: John Tuma et al., "Enrollment Trends in Vocational and Academic Education in American Public High Schools, 1969-1987," (Berkeley, CA: MPR Associates), 1989.

Recent increases in academic coursetaking among high achievers were not accompanied by comparable declines in vocational coursetaking. Nonetheless, there were important changes in vocational coursetaking over the period of study and credit disparities evident in the late 1960s appeared to be reemerging (Table 2-38). In the class of 1969, high achieving students took less vocational education than in any subsequent period. "Mostly A" students took an average of only 1.76 credits, and only 74.4 percent of such students took any vocation education. Among "mostly B" students, vocational credits averaged 3.30 in 1969 with 89.2 percent taking any vocational education. "Mostly C" and "below C" students took about a credit more in vocational courses and almost all such students took some vocational education. Another way to express the difference is to note that "mostly A" students took an average of only about 40 percent of the vocational education credits taken by "below C" students in the class of 1969.

During the 1970s, all achievement groups increased their vocational coursetaking. The greatest increase was among "mostly A" students, whose average vocational coursetaking rose by over 2 credits to 3.79 by the classes of 1979-82 with 95.2 percent of this group taking some vocational education. At the same time, "below C" students increased their vocational coursetaking

Table 2-38

Vocational Credits by Student GPA: High School Classes of 1969-1987

	Class(es) of:				
	1969	1975-1978	1979-1982	1982	1987
High School Grades					
Mostly A	1.76	3.40	3.24	2.94	2.77
Mostly B	3.30	4.44	4.40	4.12	3.90
Mostly C	4.29	5.04	5.25	5.00	4.78
Below C	4.37	5.33	5.03	5.08	4.83

Source: John Tuma et al., "Enrollment Trends in Vocational and Academic Education in American Public High Schools, 1969-1987," (Berkeley, CA: MPR Associates), 1989.

by 1.35 credits to 5.72. As a result, the difference in vocational credits earned by the highest and lowest achieving students decreased. The typical "mostly A" student took about 66 percent of the vocational credits of a "below C" student in that time period.

In the early 1980s, the vocational credits of the highest achieving group began to decline more rapidly than those of other achievement groups. By the class of 1987, "mostly A" students took an average of 2.94 vocational credits, although the percentage of "mostly A" students participating in some vocational education remained high at 97.8 percent. "Mostly C" and "below C" students continued to take more than 5 credits in vocational education. As a result, the participation rate of "mostly A" students declined to about 58 percent that of the lowest achievement group; not as low as in the class of 1969, but a considerable drop off from the late 1970s.

Observing the change in mix of vocational credits between C&HE, GLMP and SLMP, it can be seen that lower achieving students took a greater percentage of their vocational education in SLMP in all the years under examination (Table 2-39). Over time, however, most achievement groups increased the percentage of courses they took in SLMP, with the greatest increase for "mostly A"

students. In the class of 1969, "mostly A" students who took any vocational education spent only 44 percent of their vocational instruction time in SLMP while "mostly C" students with any vocational credits spent 60 percent and "below C" students with vocational credits took 63 percent of those credits in SLMP. In the mid-1970s, the participation of high achieving students in SLMP increased and, despite the decrease in overall vocational credits in the early 1980s, held steady. By the class of 1987, "mostly A" students with vocational credits took 58 percent of their vocational education in SLMP while "mostly C" students with vocational credits took 66 percent and "below C" students took 63 percent in SLMP. SLMP courses had considerably more high achieving participants by the end of the period than at the beginning.

In general, then, increases in academic coursetaking among higher achieving students were accompanied by decreases in vocational coursetaking, but most of the additional academic coursetaking was the result of increases in total credits, not decreases in vocational credits. The largest vocational credit decline took place among "mostly A" and "mostly B" students, and occurred during the 1980s. Although there are not enough data points to draw conclusions, the overall trend appears to be one of growing disparity. High achieving students are taking increasingly more academic credits while low achieving students are not. At the same time, high achieving students appear to be taking less vocational education than in the mid 1970s, while the vocational coursetaking of low achieving students has held relatively steady.

Coursetaking Patterns and Future Plans

In theory, plans for work and further education should influence the high school coursetaking patterns of students. Students who plan to obtain no additional formal education beyond high school should, presumably, be more interested in enrolling in vocational preparation courses in high school. In general, that is what the data suggest. However, students planning to attend some college, but not four-year institutions, have high school vocational participation patterns closer to those of students

Table 2-39

C&HE, GLMP, and SLMP Credits Earned by Students
Taking Any Vocational Courses by GPA, 1969-1987

Class(es) of	Average Credits		
	C&HE	GLMP	SLMP
1969			
Mostly A	0.24	0.75	0.77
Mostly B	0.41	1.12	1.78
Mostly C	0.59	1.14	2.56
Below C	0.51	1.11	2.75
1975-1978			
Mostly A	0.55	1.04	1.81
Mostly B	0.69	1.38	2.38
Mostly C	0.72	1.32	2.99
Below C	0.32	1.33	3.68
1979-1982			
Mostly A	0.60	1.08	2.11
Mostly B	0.63	1.29	2.66
Mostly C	0.74	1.34	3.36
Below C	0.97	1.13	3.62
1982			
Mostly A	0.51	0.84	1.89
Mostly B	0.64	0.97	2.78
Mostly C	0.76	1.10	3.39
Below C	0.79	1.07	3.17
1987			
Mostly A	0.38	0.75	1.81
Mostly B	0.55	0.92	2.65
Mostly C	0.69	0.98	3.32
Below C	0.65	0.96	3.47

Source: John Tuma and Antoinette Gifford, "Higher Graduation Standards and Their Effects on Coursetaking Patterns of College and Noncollege-Bound High School Graduates," (Berkeley, CA: MPR Associates) n.d.

with no postsecondary plans than to those of students planning to attend four-year institutions.[37] Because of anomalies in its data on postsecondary plans, the transcripts of class of 1969 are omitted from this discussion.

The percentage of students planning to work full time after high school was relatively steady until the 1980s. Omitting the class of 1969, about a third of the students in each of the classes between 1975 and 1982 planned to work full time after high school, while between 35 and 47 percent of students planned to attend four-year institutions (Table 2-40). In the class of 1987, however, the percentage of students planning to work full time after high school declined to only 16.5 percent, and the percentage of students planning to attend a four-year institution rose to a high of 50.7 percent. This change roughly paralleled the increased academic coursetaking of the 1980s and was likely a related phenomenon.

Despite the change in anticipated behavior, the relationship between postsecondary plans and mix of academic and vocational education appeared similar throughout the period of study (Table 2-41). Students planning to work full time after high school took the fewest credits in each period and those expecting to attend four-year institutions took the most. Although the total credits of all groups increased over time, the gap in total credits between those expecting to work full time and those expected to attend four-year colleges was virtually the same for the classes of 1975-78 and the class of 1987. In both periods, those expecting to work full time took about 9.4 percent fewer total credits than those planning to attend four-year institutions. The total average credits for those planning to attend less than four years of college were roughly in between.

---

[37] The data in this section of the report are taken from additional analyses completed by John Tuma and Antoinette Gifford, and reported in "Higher Graduation Standards and Their Effect on Coursetaking Patterns of College and Non College-Bound High School Graduates," MPR Associates, Inc. n.d. It should be noted that the percentage of students planning on full time work was very low in the class of 1969, for unexplained reasons. In addition, NLS-Youth cohorts appear to have been asked a somewhat different question about less-than-baccalaureate post high school plans than other respondents making the high post-school classifications across data sets difficult. Overall, there is considerable variability in postsecondary plans across the data sets which may be due to sampling error.

Table 2-40

Post High School Plans of High School Graduates, 1969-1987

Plans	Percentage of Class(es)				
	1969	1975-1978	1979-1982	1982	1987
Full-time Work	1.8	29.7	36.1	31.0	16.5
2-yr. college	13.5	23.2	17.7	15.0	22.0
4-yr. college	41.3	47.0	46.1	35.0	50.7
Other	43.4	--	--	19.0	10.8

Source: John Tuma and Antoinette Gifford, "Higher Graduation Standards and Their Effects on Coursetaking Patterns of College and Noncollege-Bound High School Graduates," (Berkeley, CA: MPR Associates) n.d.

Like total credits, the gap in academic credits between those planning to attend four-year institutions and those planning to work full time remained relatively steady, though it appeared to widen slightly in the 1980s. Those planning to attend less than four years of college demonstrated patterns of academic participation increasingly similar to those of students preparing to work full time. In the classes of 1975-78, students planning to attend four-year institutions took an average of 15.65 academic credits, those planning to attend two-year schools took 13.19 academic credits, and those planning to work took 11.91.[38] In the 1980s, the academic credits of those planning on attending four-year institutions rose two credits--to 17.65 credits for the class of 1987. For those planning on two-year colleges, the increase was considerably smaller, averaging 1.09 credits or 14.28 total academic credits for the class of 1987. For those planning to work, the increase was 1.26 credits to 13.17 credits. What this meant was that the typical student who planned to attend a four

[38] It should be noted that for all groups, academic credits had dropped substantially from those reported for the class of 1969--although those data are probably not appropriate for other parts of this analysis.

Table 2-41

Total Credits Completed and Percentage of Students Participating in the Various High School Curricula, by Year of Graduation and Plans After High School, 1969-1987

Class and Postsecondary Plans	Total Credits	Academic Credits	Vocational Credits	Percent Who Took Vocational Credits	Personal Use/Other Credits	Percent Who Took Personal Credits
1969						
FT Work	19.92	12.97	5.31	100.00	1.64	100.00
2-yr. college	20.91	14.32	4.24	97.55	2.34	95.74
4-yr. college	20.77	16.68	2.19	83.81	1.90	97.06
1975-78						
FT Work	20.15	11.91	6.08	99.70	2.16	96.89
2-yr. college	20.67	13.19	5.11	98.49	2.37	97.97
4-yr. college	21.23	15.65	3.20	93.92	2.37	97.13
1979-82						
FT Work	20.81	12.07	6.34	99.56	2.40	98.45
2-yr. college	21.03	12.98	5.64	99.76	2.39	98.49
4-yr. college	21.56	15.68	3.46	95.57	2.41	98.93
1982						
FT Work	21.00	12.44	5.92	99.51	2.61	99.17
2-yr. college	21.67	14.40	4.40	98.18	2.83	98.29
4-yr. college	22.13	16.53	3.09	94.99	2.50	98.54
1987						
FT Work	21.89	13.17	6.31	99.62	2.41	98.78
2-yr. college	22.23	14.28	5.41	99.61	2.54	98.38
4-yr. college	23.31	17.65	3.21	96.71	2.46	97.60

Source: John Tuma and Antoinette Gifford, "Higher Graduation Standards and Their Effects on Coursetaking Patterns of College and Noncollege-Bound High School Graduates," (Berkeley, CA: MPR Associates) n.d.

year institution in the classes of 1987 took roughly 13 percent more academic credits taken by a comparable student in the classes of 1975-78, while the typical student planning to work took 11 percent more and students planning on less than baccalaureate education took only 8 percent more.

The trend toward greater similarity in coursetaking between work- and less-than-baccalaureate- bound students is more pronounced when participation in advanced courses is examined. In calculus and other advanced math courses, the typical work-bound student took an average of .17 of a credit in the class of 1975-78, those planning on "some" college took .31 of a credit, while those planning on attending four-year institutions took .84 of a credit (Table 2-42). The gap between those bound for work and two-year colleges on the one hand and those planning on attending four-year institutions widened considerably over time, so that by the class of 1987, the typical work-bound student was taking .27 of a credit, the student planning on attending a two-year college was taking .41 of a credit, and the typical student planning on attending a four-year institution was taking 1.23 credits. A similar pattern occurred in participation in chemistry and physics courses.

In vocational participation, work- and less-than-baccalaureate-bound students looked more alike than four-year college bound students throughout the period, and the differences among groups changed little over time. Work- and less-than-baccalaureate bound students took considerably more vocational education than those students planning to attend four-year institutions (see Table 2-41). In the classes of 1975-78, the typical work-bound students took 6.08 credits or almost twice the vocational education taken by students planning on attending four-year institutions. In the class of 1987, the typical work-bound student took 6.31 vocational credits or around twice the amount of vocational education taken by those students planning on attending four-year institutions. In the classes of 1975-78, students planning on less than baccalaureate postsecondary education took about 60 percent more vocational education than the four-year college bound and in the class of 1987, they took 69 percent more.

Observing vocational participation in greater depth, the continuing differences among the three groups were repeated (Table 2-43). With respect to C&HE, students planning to work or

Table 2-42

Average Number of Credits Completed in Academic Subjects, by Plans After High School and Year of Graduation, 1969-1987

Class and Postsecondary Plans	English	Mathe-matics	Calculus & Advanced Math	Science	Chemistry and Physics	Social Studies	Fine Arts	Foreign Language
1969								
FT Work	3.92	1.59	0.22	1.92	0.20	3.57	1.24	0.72
2-yr. college	3.90	2.38	0.43	2.11	0.29	3.27	1.26	1.41
4-yr. college	4.19	2.99	0.87	2.52	0.81	3.37	1.22	2.39
1975-78								
FT Work	3.55	1.84	0.17	1.81	0.22	3.04	1.19	0.47
2-yr. college	3.56	2.12	0.31	2.02	0.37	3.15	1.50	0.84
4-yr. college	3.82	2.78	0.84	2.67	0.80	3.23	1.48	1.66
1979-82								
FT Work	3.66	1.94	0.21	1.71	0.26	3.07	1.31	0.38
2-yr. college	3.66	2.17	0.38	1.90	0.39	3.02	1.47	0.76
4-yr. college	3.87	2.94	0.84	2.67	0.83	3.20	1.59	1.41
1982								
FT Work	3.75	2.08	0.25	1.75	0.19	3.06	1.34	0.46
2-yr. college	3.91	2.56	0.59	2.13	0.48	3.24	1.49	1.08
4-yr. college	4.04	3.20	1.16	2.82	0.99	3.25	1.57	1.65
1987								
FT Work	3.79	2.46	0.27	1.94	0.20	3.03	1.33	0.62
2-yr. college	3.91	2.70	0.41	2.20	0.37	3.14	1.32	1.00
4-yr. college	4.13	3.46	1.23	3.12	1.14	3.36	1.57	2.02

Source: John Tuma and Antoinette Gifford, "Higher Graduation Standards and Their Effects on Coursetaking Patterns of College and Noncollege-Bound High School Graduates," (Berkeley, CA: MPR Associates) n.d.

complete less than a bachelor's degree took almost identical amounts of instruction and participated at roughly comparable rates throughout the period. Students planning to attend four year institutions participated at lower rates and their participation rate dropped slightly in the 1980s. They took roughly 55 percent of the C&HE credits taken by the other two groups throughout the period under investigation.

With respect to the GLMP, the pattern was similar but the differences were smaller. Students planning to work full time or complete less than a bachelor's degree took similar amounts of instruction, although their participation dropped from about one and a half units to about a unit over the period from the mid 1970s to the class of 1987. Students planning to attend four-year institutions participated at an only slightly lower rate, but they took consistently fewer credits--slightly above .8 of a credit in the classes of 1982 and 1987. Their participation was lower than the other two groups throughout but declined less in the 1980s. It is likely that typing accounted for a substantial amount of their GLMP coursetaking.

It is in the SLMP, however, that the differences between groups were most important, because this was where students took an increasing amount of their overall vocational instruction. In the SLMP, work-bound students and students planning on completing less than a bachelor's degree took considerably more vocational education than students planning on attending four-year colleges. Further, SLMP coursetaking increased for both of the former groups through most of the period, and especially between the classes of 1982 and 1987.[39] By contrast, between those two classes it increased only slightly for students planning to attend four-year institutions, although it was a higher percentage of all vocational courses taken by four-year college bound students than other students because they took so little in the rest of the vocational curriculum.

---

[39] There was an apparent dip in participation by 2-year college goers in the class of 1982 but the definitions of postsecondary plans used in this data set were not the same as the definitions used for the previous data sets.

Table 2-43

Total Credits Completed and Percentage of Students Participating in the Various Vocational Curricula, by Plans After High School and Year of Graduation, 1969-1987

Class and Plans	C&HE Credits	Percent that Took C&HE Credits	GLMP Credits	Percent that Took GLMP Credits	SLMP Credits	Percent that Took SLMP Credits
1969						
FT Work	1.72	79.97	1.37	92.74	2.22	76.62
2-yr. college	0.48	31.90	1.37	84.49	2.39	83.00
4-yr. college	0.24	20.52	0.79	66.79	1.16	52.61
1975-78						
FT Work	0.87	55.31	1.56	87.29	3.65	92.87
2-yr. college	0.77	54.97	1.42	85.54	2.92	88.19
4-yr. college	0.48	41.42	0.99	79.15	1.73	73.44
1979-82						
FT Work	0.86	58.34	1.52	83.04	3.96	92.83
2-yr. college	0.88	58.65	1.33	87.32	3.43	92.79
4-yr. college	0.48	44.20	1.04	80.03	1.95	76.65
1982						
FT Work	0.77	54.22	1.18	79.31	3.97	93.41
2-yr. college	0.73	53.44	1.04	83.20	2.63	87.27
4-yr. college	0.43	37.41	0.84	78.61	1.83	76.52
1987						
FT Work	0.79	52.75	1.06	82.65	4.46	92.97
2-yr. college	0.76	54.51	1.06	83.91	3.59	92.64
4-yr. college	0.43	37.46	0.81	78.21	1.97	81.04

Source: John Tuma and Antoinette Gifford, "Higher Graduation Standards and Their Effects on Coursetaking Patterns of College and Noncollege-Bound High School Graduates," (Berkeley, CA: MPR Associates) n.d.

Coursetaking and Mothers' Education

For all classes other than the class of 1987, information is available on total credits, academic credits, and vocational credits based on both fathers' and mothers' educational level.[40] Because mothers' education is generally viewed as a better indirect indicator of socioeconomic status, this indicator is reported here. It is important to bear in mind, however, that mothers' education is based on the report of high school age offspring and may not be accurate.

There appeared to be only a slight relationship between mothers' educational level and students' overall credit accumulation (Table 2-44). In the class of 1982, for example, students who reported that their mothers had less than a high school education took an average of 21.01 credits while those who reported that their mothers had advanced degrees took an average of 22.09. Differences in academic and vocational course participation were greater, however, and paralleled the differences seen in the analysis of high school achievement and post high school plans. In the class of 1982, students who reported that their mothers completed less than a high school degree took 13.08 academic credits while those who report that their mothers went to graduate school, took an average of 16.52 academic credits (Table 2-45). At the same time, those with mothers who completed less than high school took, on average, twice as much vocational education (5.90 credits) as those who reported that their mothers had graduate education (2.99 credits) (Table 2-46).

SUMMARY AND IMPLICATIONS OF TRENDS IN COURSETAKING

The overall trend in coursetaking discussed in this chapter appears to be a gradual and then steep increase in total credits throughout the period, a decline in academic and an increase in vocational coursetaking in the 1970s, and a resurgence of academic coursetaking in the 1980s

---

[40] Information is also available on parents' income for some data sets, but it is generally thought to be inaccurate for the class of 1982 because it is based on student reports. It is unavailable for the class of 1987. As a result, income data are not included in this report.

Table 2-44

Total Credits Earned by High School Graduates by Mother's Education, 1969-1987

	Total Credits, Class(es) of:				
	1969	1975-1978	1979-1982	1982	1987
Mother's Education					
Less Than High School	19.98	20.27	20.84	21.01	--
High School Only	20.37	20.80	21.18	21.53	--
Some College	20.57	20.92	21.49	20.70	--
4 Years of College	20.56	21.75	21.82	21.92	--
Advanced Degree	20.48	20.95	20.77	22.09	--

Source: John Tuma et al., "Enrollment Trends in Vocational and Academic Education in American Public High Schools, 1969-1987," (Berkeley, CA: MPR Associates), 1989.

Table 2-45

Academic Credits Earned by High School Graduates by Mother's Education, 1969-1987

	Academic Credits, Class(es) of:				
	1969	1975-1978	1979-1982	1982	1987
Mother's Education					
Less Than High School	13.83	12.49	12.80	13.08	--
High School Only	14.74	13.68	13.71	14.02	--
Some College	15.66	15.18	14.64	14.95	--
4 Years of College	16.43	16.78	16.30	16.21	--
Advanced Degree	16.75	16.19	17.30	16.52	--

Source: John Tuma et al., "Enrollment Trends in Vocational and Academic Education in American Public High Schools, 1969-1987," (Berkeley, CA: MPR Associates), 1989.

Table 2-46

Vocational Credits Earned by High School Graduates by Mother's Education, 1969-1987

	Vocational Credits, Class(es) of:				
	1969	1975-1978	1979-1982	1982	1987
Mother's Education					
Less Than High School	4.52	5.49	5.15	5.40	--
High School Only	3.88	4.84	4.69	4.89	--
Some College	2.96	3.37	3.95	4.06	--
4 Years of College	2.16	2.47	2.75	3.09	--
Advanced Degree	1.89	2.61	2.18	2.99	--

Source: John Tuma et al., "Enrollment Trends in Vocational and Academic Education in American Public High Schools, 1969-1987," (Berkeley, CA: MPR Associates), 1989.

accompanied by a slight decline in vocational coursetaking. The most notable divergence from this pattern occurs in the case of Asian students, whose academic participation does not decline during the 1970s. Other important findings include the considerable disparity in academic coursetaking between high and low achieving students, between students planning to attend four-year institutions and those planning to work full time after high school, and between those whose mothers had limited and extensive formal education. The disparity between high and low achieving students may be increasing.

At first glance, these findings appear to support the role of the academic reform movement in fostering changes in coursetaking. In general, academic coursetaking increased during the 1980s after a decade or more of decline. Observed in detail, however, the data raise a number of questions about the direct effects of reform. Also of concern are the changes that have occurred for those students whose performance reformers most sought to improve.

One of those questions about the impact of reform concerns the timing of the curriculum changes observed here. From these data, the inception of increases in academic coursetaking appears to have predated the reform movement. The increases began with the class of 1982, whose academic credits were higher than those of students in, at least, the preceding six or seven graduating classes. The increases accelerated in the early 1980s, so that the academic credits of the class of 1987 were the highest of any class in the data sets. Nonetheless, most of the state-level increases in graduation requirements were enacted in the mid-1980s and were often scheduled to be implemented for classes graduating late in that decade. This means that it may even be difficult to attribute the performance of the class of 1987 to those mandates in most states.

In further support of that conclusion, the greatest academic coursetaking increases in the 1980s have been registered by high achieving students and those students planning on attending four-year postsecondary institutions. At the same time, most of the state (and local) mandates increased high school graduation minimum requirements, and hence were aimed at improving the academic participation of those taking few academic units. In fact, the rate of academic coursetaking of students with the poorest achievement appears to have increased, but the increase was the least of any achievement group between the class of 1982 and that of 1987. The gap between high-achieving and low-achieving students actually widened slightly. As a result, it is hard to attribute the changes that have occurred to the movement to stiffen high school graduation requirements directly. More likely explanations might include increased entrance requirements by state university systems or other state or local policies aimed at higher performing students.

Another assumption of some reformers has been that achievement declined in the 1970s because students spent fewer hours in school. They argue that the school day and year should be extended. While it is impossible to comment definitively on this concern, the time series data suggest that time in school has not declined. Assuming that the definition of a credit remains steady over

time, students appear to be spending *more* hours in high school with each successive graduation class. It is possible, of course, that the school year has been shortened over time but there is no way of determining total school days from these data. Until the 1980s, however, students were spending their additional credit hours not in academic courses but rather in vocational and personal/other coursetaking.

Perhaps the most important findings from these data are the considerable and persistent differences in coursetaking patterns between high- and low-achieving students, and presumably between students with high and low SES (defined here as mother's education) although class of 1987 data are not available. Despite increases in academic participation by all groups during the 1980s, the gap in academic coursetaking between high-and low-achieving students stood at roughly the same level in the class of 1987 as it did in the class of 1969. Ironically, convergence in the 1970s was due to decreases in academic coursetaking among high-achieving students rather than increases among the low achieving.

These differences are not only persistent, they are substantial. In the class of 1987, "mostly A" students took 46 percent more academic coursework than "below C" students and 31 percent more than "mostly C" students. The "mostly A" students spent about 77 percent of their time in high school in academic courses while "mostly C" students spent only 65 percent.[41] From these data, it is impossible to know the extent to which performance is linked to choice of courses, but the clear implication of the data is that the educational system is exposing high- and low-achieving students to different high school curricula, and that the differences continue despite reform. This was hardly the desired effect of academic reform; in fact, the inadvertent effect of reform may have been to widen the differences slightly. The findings beg the questions of whether there is a minimum level of academic instruction that all students should obtain, and whether the current degree of disparity in

[41] Below C students are spending 64 percent of their time in academic courses.

academic instruction is desirable or reasonable. At the same time, however, lower achieving students take considerably more vocational education than other students. Further, their participation in vocational education did not decline in the 1980s. In the class of 1987, "mostly C" students spent 23 percent of their time in high school in vocational education and "below C" students spent 25 percent. Between the classes of 1982 and 1987 these vocational participation rates dropped one percent. At the same time, "mostly A" students spent only 12 percent of their time in vocational education in 1987, a 3 percent drop from the class of 1982. Low achieving students took a greater percentage of their courses in the SLMP than other students, which suggests that they were using vocational education as work preparation.

Vocational educators may bemoan the attrition of high achieving students from their classes, but another way to consider these data is to view students' course choices as reflections of their interests. This leads to the question of what low achieving students (and students planning to work full time after high school or attend a two-year institution) get from vocational instruction. Given their substantial investment in this part of the curriculum and their more limited academic course participation, is vocational education preparing them effectively for work and for additional education or training? Is it providing academic skills they may not have the opportunity to obtain elsewhere? While there are no readily available measures of the contribution of vocational education to vocational performance, the next chapter will describe those outcomes of secondary vocational education studied by the NAVE for which information is currently available.

Chapter 3

Outcomes of Secondary Vocational Education

This chapter assesses the effects of secondary vocational education in two arenas. First it examines the efficacy of vocational education as a means to learn academic skills. It then turns to examining the extent to which occupationally specific secondary vocational education is used by students in subsequent employment.[42]

EFFECTS OF VOCATIONAL EDUCATION ON LEARNING MATHEMATICS

As discussed in Chapter 2, enrollments in mathematics and science courses increased substantially between the classes of 1982 and 1987. Despite this encouraging finding, it is still not known whether the trend will continue, and a quarter of all high school students continue to take no mathematics beyond the 10th grade. In the past few years, a great deal of interest among educators has focused on new ways of integrating mathematics (and other subjects) with vocational education. In fact, evidence to be presented here demonstrates that mathematics learning is a natural by-product of certain types of (math-related) vocational education. Greater enrollment in these "applied mathematics" courses could substantially increase the mathematics learning of high school students, particularly those students who shy away from traditional math courses. By extension, greater enrollment in "applied reading," "applied communications," and "applied science" courses could also enhance learning in these core skill areas.

Background

In 1983, the report, *A Nation at Risk*, recommended that states require high school graduates to take a minimum of three years of mathematics and three years of science in grades 9 through 12.

---

[42] Both parts of this chapter report on research designed and conducted by Robert Meyer, a member of the NAVE staff who also wrote this chapter.

A Nation at Risk also recommended that graduates be required to take at least four years of English, three years of social studies, and one-half year of computer science.[43] About half of the graduates of the high school class of 1982 would have satisfied the recommended math requirements.

The response by states to the recommendations contained in *A Nation At Risk* and other commission reports was rapid. Within 12 months, 35 states introduced or strengthened their graduation requirements (Bennett, 1988). Only 10 states adopted the recommended math requirement of three years of mathematics, however, and only three states adopted the recommended science requirement of three years.

Mathematics enrollments increased dramatically from 1982 to 1987, from an average of 2.62 credits to 3.07 credits. But most of the increase occurred among students taking 3.5 or more mathematics courses, although the share of students taking this many math courses increased from 26.3 to 39.6 percent. Given the growing importance of mathematics in post-secondary technical and scientific training, the large increase in students taking mathematics throughout their four years of high school is positive. On the other hand, the share of students taking two or fewer years of mathematics, that is, *no* mathematics appropriate to grades 11 and 12, remained quite large, 28.3 percent. Given that students with the poorest mathematics skills tend to obtain the least amount of mathematics education (Table 3-1), it is unfortunate that a large segment of American youth continues to receive limited amounts of high school mathematics training.

Further, despite the enrollment increases, math and science education together accounted for only 25 percent of all high school coursework in 1987. At the same time, vocational education was the single largest subject area in the high school curriculum, accounting for about 20 percent of high school courses (4.21 credits in 1987), even surpassing English (4.02 credits), and social studies/history (3.33 credits). The dominance of vocational education was especially acute during the

---

[43] For college bound students, an additional two years of foreign language was recommended.

Table 3-1

Average Math Test Scores by Math Enrollment and by Educational Attainment, High School Class of 1982

	Sophomore Score	Senior Score	Change in Score
Math Enrollment (credits)			
1 - 1.99	8.795	9.301	0.506
2 - 2.99	10.110	10.992	0.882
3 - 3.99	14.064	16.471	2.405
4+	18.365	22.084	3.719
Educational Attainment			
High school dropouts	5.78	6.15	0.37
Noncollege-bound graduate	9.46	10.54	1.08
College-bound graduate	17.22	19.93	2.71
All students	13.44 (9.70)	15.35 (10.65)	1.92 (5.87)

Standard deviations in parentheses.

Source: High School and Beyond Study/Sophomore cohort.

last two years of high school, as indicated in Table 3-2. Moreover, enrollments in vocational educatior were not limited to noncollege-bound students. College-bound students in the class of 1982 took almost twice as much vocational education as mathematics during their last two years of high school. Noncollege-bound students took almost seven times as much vocational education as mathematics--in other words, very little mathematics (0.56 credits) and a lot of vocational education (3.77 credits). For the entire four years of high school, college-bound students (representing 62 percent of all high school graduates) accounted for 48 percent of all high school vocational enrollments. Excluding vocational courses that are introductory (e.g., typing 1, work experience) or (sometimes) required (consumer and homemaking education or industrial arts) does not alter the

Table 3-2

Average Course Enrollments in Grades 11 and 12 for Graduates of the Class of 1982

	Total HS Credits	Math	Science	English	Social Studies	Fine Arts	Foreign Languages	Vocational Education	Personal and Other
Noncollege-bound graduates	10.14	0.56	0.39	1.81	1.81	0.64	0.13	3.77	1.04
College-bound graduates	10.66	1.26	1.08	1.96	1.89	0.72	0.56	2.04	1.16

Source: High School and Beyond Study/Sophomore Cohort.

finding. College-bound students also accounted for 48 percent of all occupationally specific vocational coursework.

Given that math and science account for only 25 percent of the high school curriculum and vocational education alone comprises almost as much, it is fruitful to consider the extent to which other parts of the curriculum--particularly vocational education--could contribute to the development of mathematics and science skills. More generally, it is important to consider the extent to which training in core skills (including, but not necessarily limited to mathematics, reading, communications, and science) could be infused into the entire high school curriculum--i.e., part of an integrated approach to learning.

Such a curriculum would have many advantages. Students who would otherwise stop their training in mathematics and science at the end of 10th grade, might voluntarily enroll in courses that teach mathematics and science in a rigorous, but applied manner. Blending abstract and applied training within a common context (for example, a course in geometry and drafting) might generate greater learning than isolated, unconnected training (e.g. separate geometry and drafting courses). This section discusses research that assesses the feasibility and potential of teaching mathematics within an applied context.

Applied Learning of Mathematics

The idea behind this research was to determine whether mathematics learning was a natural by-product of courses other than mathematics; in particular, vocational education and science. Courses in vocational education and science were subjectively classified into six subgroups:

- Applied math (e.g., consumer mathematics, technical mathematics, vocational mathematics)
- Specific vocational math (e.g., agricultural mathematics, business mathematics I and II)

- Math-related vocational education (e.g., bookkeeping, data processing, drafting, electronics, real estate)
- Nonmath-related vocational education
- Math-related science (chemistry and physics)
- Nonmath-related science (survey science and biology)

Mathematics courses were classified into nine areas, following the Secondary School Course Taxonomy described earlier. They included basic math, general math, pre-algebra, Algebra I, Geometry, Algebra II, pre-calculus, calculus, and computer math. It was not possible to obtain reliable estimates of the effects of basic math and computer math since there were limited enrollments in these two areas during the interval studied (11th and 12th grades). The analyses also included enrollments in courses hypothesized not to contribute to mathematics development: English, social studies, fine arts, foreign languages, and personal/other courses.[44]

The math-related courses listed above included full-time as well as part-time applications of mathematics. As of 1982, the year in which members of the sample graduated from high school, these courses may also have varied in the level of mathematics used. For example, physics courses may have made use of more advanced mathematics while math-related vocational education courses may have made use of more basic mathematics, in general. The 19 course variables given above were used, along with demographic characteristics *and* a measure of 10th grade mathematics proficiency, to explain individual variation in 12th grade mathematics proficiency. The analysis was conducted separately for noncollege and college-bound students using the sophomore cohort of the High School and Beyond Study, a nationally representative sample of high school sophomores.

---

[44] As expected, these courses were found not to have contributed to mathematics proficiency, and thus will not be discussed here.

Estimates of the contribution to 12th grade mathematics proficiency of the math-related courses are given in Table 3-3.[45]

Table 3-3

Estimates of the Contribution of Traditional Math and Applied Math Courses to Growth in Mathematics Proficiency

	Noncollege-Bound Students		College-Bound Students	
	Coefficient	Standard Error	Coefficient	Standard Error
Traditional Mathematics:				
Basic math	[a]		[a]	
General math	0.264	(0.268)	0.961	(0.300)
Pre-Algebra	2.117	(0.624)	1.451	(0.440)
Algebra I	2.473	(0.385)	2.285	(0.292)
Geometry	2.070	(0.324)	1.155	(0.198)
Algebra II	1.963	(0.334)	1.760	(0.177)
Pre-Calculus	1.532	(0.423)	1.237	(0.240)
Calculus	[a]		1.212	(0.648)
Math Applications:				
Applied math	0.630	(0.030)	1.355	(0.389)
Specific vocational math	0.033	(0.397)	1.702	(0.458)
Chemistry/Physics	0.885	(0.279)	0.797	(0.151)
Math-related vocational education	0.216	(0.100)	-0.045	(0.110)
Sample Size	4,448		5,368	

[a]The sample size was too small to generate statistically reliable estimates.

Source: High School and Beyond Sophomore Cohort.

[45] The estimates presented in this chapter are based on the two stage least squares model. The model is used to control for measurement error in the 10th grade mathematics test, a right-hand side regressor. The instrumental variables used include 9th/10th grade courses, as well as the exogenous variables in the regression model: 11th/12th grade courses and demographic characteristics.

Although enrollment in conventional mathematics courses is related to the greatest gains in math skills, there is some evidence that mathematics skills can be learned outside of traditional mathematics courses.[46] For college-bound students, participation in a specific vocational math course (such as business math) increases mathematics proficiency by 1.70 points, which is equivalent to the contribution of Algebra II. While the effects of applied mathematics and specific vocational math are substantially higher for the college-bound than for the noncollege-bound group, the contributions of traditional math, chemistry, and physics, are nearly identical for both groups. The disparity in the effects of applied math courses for college and noncollege-bound students may mean that the applied math courses taken by noncollege-bound students are "pitched" at too elementary a level.

Math-related science courses (i.e., chemistry and physics) make surprisingly large contributions to math proficiency for both noncollege and college-bound students--on the order of half the effect of geometry, algebra II, or precalculus. These results provide the strongest evidence that mathematics can be learned through application.

The results for math-related vocational education also provide support for learning through application, although the effectiveness of these courses is limited to noncollege-bound youth. The estimates imply that 5 credits of math-related vocational education would increase the mathematics proficiency of noncollege-bound students by 1.10 points. An increase of this size would double the average two-year increase in math scores for the noncollege-bound group. Enrolling in five math-related vocational courses is not unrealistic given that noncollege-bound students in our sample took

---

[46] The reported estimates indicate the average increment in mathematics proficiency associated with a one credit high school course. A coefficient estimate of 2.0, for example, corresponds to two correct items on the HS&B math test. The contribution of, for example, 4 credits is given by the reported estimates multiplied by 4. To eliminate the statistical distortions arising from individuals with perfect test scores--the so-called ceiling effect--the college-bound sample excludes individuals in the top 10 percent of the predicted sophomore math test distribution. Instability in estimates was consistent with the size of the reported standard errors.

an average of 5.7 credits in vocational education. However, since these courses comprise around 18 percent of the vocational curriculum, a major expansion of math-related vocational coursetaking would be needed to enable most noncollege-bound youth to take a program rich in math-related vocational education.

Policy Implications

The evidence that mathematics learning is a natural by-product of math-related science and vocational education suggests that it might be possible to design new courses that *explicitly* integrate training in mathematics and applied skills, such as drafting and electronics. Nonvocational courses, such as economics, ecology, and health might also prove conducive to integration with mathematics training. For example, a 2-credit course in "Drafting and Geometry" might be described as a course containing one unit in drafting and one unit in geometry.

Although the estimates in Table 3-3 indicate that the most effective *one-period* courses are the conventional mathematics courses, there may be advantages to the development of integrated applied courses. First, there is nothing particularly special about learning mathematics or other core skills in isolation. It may be just as effective to teach core skills in integration. The efficacy of the different approaches can only be determined by experience. Second, integrated courses may provide the opportunity for "synergism." An integrated course in "drafting and geometry," for example, might produce greater educational gains than separate courses in drafting and geometry. Thirdly, students may be willing to enroll in integrated courses even through they would not be willing to enroll in stand-alone, traditional core courses. The large voluntary enrollments in vocational education might carry over to similarly large voluntary enrollments in integrated vocational courses. Given that large numbers of high school students continue to receive limited amounts of mathematics instruction, despite the ambitious reforms of the last decade, it seems prudent to consider other alternatives to increase exposure to mathematics.

EFFECTS OF OCCUPATIONALLY SPECIFIC TRAINING ON EARLY WORK EXPERIENCE

The discussion now turns to examining the effects of occupationally specific training on early experience in the work place. The analysis employs a new measure of skill utilization that incorporates whether the jobs subsequently obtained by students require more than minimal levels of skill. The analysis is confined to students who obtain no education beyond high school. This group was selected because it enrolls in occupationally specific vocational education to a much greater degree than other students. It includes the vast majority of economically and academically disadvantaged students.

One of the most common indicators for evaluating vocational education programs has been the training-related placement rate (TRPR). This indicator measures the share of workers employed in jobs that are classified as being "related" to their previous vocational training.

Despite the fact that this indicator has been widely used by researchers and educators, the TRPR has several major deficiencies. First, it is insensitive to the number of vocational courses a student takes. Students who complete one vocational course are counted equally in computing usage rates with students who complete a large number of courses. As a result, the reported value for the utilization of vocational courses can be seriously distorted. Second, the TRP indicator ignores vocational courses taken outside of the vocational field or subject area in which the student amasses the largest number of course credits. Since these vocational courses may be related to an individual's occupation even if the primary courses are not, (or vice versa), this omission has the effect of overstating placements rates for some workers and understating them for others. Finally, the TRPR does not incorporate information pertaining to the actual level of skill required for an occupation. For example, a very low skill occupation may be nominally related to a vocational field yet require little or no preparation of any kind.

Two new indicators overcome these limitations--the course utilization rate and the skilled jobs course utilization rate. The course utilization rate (CUR) measures the share of all vocational courses taken by students that are related to jobs that they eventually obtain. The skilled jobs course utilization rate (skilled jobs CUR) measures the share of all vocational courses that are related to the jobs that the students obtain *only* when those jobs require more than minimal skills. (Jobs requiring three or fewer months of total training time are considered to require minimal skills.) As will be demonstrated below, the skilled jobs CUR is a more informative performance indicator than either the general CUR or the TRPR, if the incidence of low skill jobs is high among a population.

All analyses of the use of vocational training require some rule for determining the relatedness of training to job fields or occupations. Although it makes conceptual sense to allow occupations and training programs to be partially related, relatedness has generally been defined as an all or nothing outcome--either there is a full "match" between a course and a job or there is none. This practice is also followed in this analysis. This analysis measures the relatedness of vocational programs and occupations using a crosswalk developed by the National Occupational Information Coordination Committee (NOICC).[47]

In order to determine whether a job required preparation, the analysis uses the Specific Vocational Preparation (SVP) scale, developed by the Department of Labor. The SVP scale "...identifies the amount of time required to learn the techniques, acquire the information, and develop the facility needed for average performance in a specific job-worker situation. This training may be acquired in a school, work, military, institutional, or vocational environment. It does not include orientation training required of a fully qualified worker to become accustomed to the special

---

[47] The NOICC crosswalk is described more fully in Robin S. Horn and Robert H. Meyer, "Using the New Vocational Indicators: A Guide to Data Preparation," Mimeograph, Economics Department, University of Wisconsin, Madison, 1990.

conditions of any new job."[48] Specific vocational training includes: (a) vocational education, (b) apprenticeship training, (c) in-plant training, (d) on-the-job training, and (e) essential experience in other jobs. Occupations are classified into three skill level groups using the following criteria: (1) low job skill requirements: the job requires three or less months of total training time (SVP index $\leq$ 3); (2) medium job skill requirements: the job requires between three and six months of total training time ($3 <$ SVP index ≤ 4); and (3) high job skill requirements: the job requires more than six months of total training time (SVP index > 4). By definition, vocational courses that are related to occupations in the low skill category are not considered as matched or utilized courses in the skilled jobs CUR. Examples of occupations from the three skill groups are reported in Table 3-4.

Sources of Data

The data base used in the analysis is the sophomore cohort of the High School and Beyond (HS&B) Study. HS&B reports the occupations held by individuals using three-digit 1970 Census occupational codes. The linked HS&B transcript file reports high school courses in terms of six-digit Classification of Secondary School Courses (CSSC) codes, which if truncated to four-digits are identical to four-digit Classification of Instructional Program (CIP) codes. The NOICC crosswalk indicates whether or not four-digit CIP vocational programs and three-digit Census occupations are related.

The particular jobs held by individuals in the HS&B sample were not rated according to the SVP scale. However, SVP values were assigned to all jobs since workers' occupations were reported and coded according to the three-digit 1970 census occupational code. Miller, et al. (1980) reports average SVP values for the 1970 census occupations. These SVP values were merged into the HS&B sample. This analysis was conducted only for students with no postsecondary education.

---

[48] U.S. Department of Labor, *Handbook For Analyzing Jobs* (Washington, DC: GPO) 1962.

Table 3-4

Example Occupations by Skill Level

Low Skill Occupations	High Skill Occupations
Cashier (310)	Draftsman (152)
Stockhandlers (762)	Photographer (191)
Cleaners and Chairwoman (902)	Manager, Restaurant, Cafe, Bar (230)
Busboys (911)	Sales Managers, Retail (231)
Dishwashers (913)	Sales Representatives (281, 282)
Food Counter and Fountain Workers (914)	Bank Teller (301)
Waiters (915)	Secretaries (370-372)
Child Care, Private Household (980)	Brick Masons and Stone Masons (410)
	Cabinet Makers (413)
Medium Skill Occupations	Carpenters (415)
	Baker (402)
Sales Clerk, Nondurable Retail (283)	Electricians (430)
Bookkeeper (305)	Foremen (441)
File Clerks (325)	Machinists (461)
Key Punch Operators (345)	Automobile Mechanics (473)
Telephone Operators (385)	Painters (510)
Typist (391)	Welders (680)
Garage Workers and Gas Station Attendants (623)	Farmer: Owner/Tenant (801)
	Dental Assistant (921)
Machine Operatives (690)	Practical Nurses (926)
Truck Drivers (715)	
Gardeners and Groundskeepers (755)	
Health Aides (922)	

Note: Numbers in parentheses are 1970 Census occupational codes.

Source: U.S. Department of Labor.

Findings on Course Utilization

For men and women combined, it is estimated that about 38 percent of all occupationally specific vocational courses were used in skilled jobs during the fall of 1983 (Table 3-5). This was approximately 16 months after high school graduation for most of the students. For all jobs--not just

skilled jobs--the rate of course utilization was approximately 10 percentage points higher than the skilled job rate. The general CUR thus overstated true vocational course utilization.

Table 3-5

Rates of Vocational Course Utilization

	Women	Men	All
Skilled Jobs CUR (Course Utilization Rate in Skilled Jobs)			
Fall 1983	45.9	32.6	38.4
Fall 1985	53.0	38.0	44.2
CUR (Course Utilization Rate)			
Fall 1983	61.1	39.0	48.7
Fall 1985	61.8	43.2	50.9
Sample Size			
Fall 1983	669	702	1,401
Fall 1985	667	699	1,366

Source: High School and Beyond Sophomore Cohort.

Over time, the skilled job CUR increased while the general CUR remained stable. Comparing fall 1983 and fall 1985, the general CUR increased by only two percentage points but the skilled jobs CUR increased from 38 to 44 percent over this interval. Thus, the skilled jobs CUR reflected the fact that, over time, students obtained jobs with greater skills and in their fields of training.

At both points in time, rates of skilled jobs course utilization were substantially higher for women than for men--46 versus 33 percent in 1983, and 53 versus 38 percent in 1985. The higher skilled jobs CUR for women was due, in large part, to the extensive enrollment of women in business

education (56 percent of all their occupationally specific training) and the relatively high rate at which business graduates obtained skilled, business-related jobs: 53 percent in 1983 and 65 percent in 1985 (Table 3-6). For women, rates of skilled course utilization were also relatively high in health (71 percent in 1983) and occupational home economics, the second largest vocational subject for women (51 percent in 1983). By 1985, however, the skilled jobs CUR in occupational home economics had declined to 32 percent.

Table 3-6

Rates of Vocational Course Utilization by Subject Area, Women

Vocational Subject	Share of all Specific Coursework	Skilled Jobs CUR		CUR	
		Fall 1983	Fall 1985	Fall 1983	Fall 1985
Agriculture	2.97	40.0	26.9	40.0	6.9
Business	55.96	52.6	65.4	62.7	70.7
Marketing	9.85	22.5	38.3	63.8	46.3
Health	3.40	70.7	78.8	73.5	81.0
Occupational Home Economics	18.06	51.4	31.5	79.6	64.4
Construction	0.42	0.0	0.0	0.0	0.0
Mechanics and Repairers	0.94	7.0	35.2	7.0	35.2
Precision Production	6.32	11.6	17.8	15.3	17.8
Transportation	0.03	0.0	--	0.0	--
Technical and Communications	2.05	6.1	31.6	6.1	31.6
All	100.00	45.9	53.0	61.1	61.8
Sample Size	699				

Source: High School and Beyond Sophomore Cohort.

In marketing, the third largest vocational subject for women, the skilled jobs CUR was quite low, 23 percent in 1983 and 38 percent in 1985. A major reason for these low rates was that a large share of marketing students initially worked in low skilled jobs. This explanation was evident from comparing the general and skilled jobs CURs for marketing. In 1983, the skilled jobs CUR was less than the general CUR by over 40 percentage points.

Uniformly low rates of course utilization were found for women in the traditionally male trades and industry subjects--substantially less than 20 percent in most cases. These courses accounted for only 8 percent of all vocational enrollments among women. The few women who completed nontraditional training failed to obtain related jobs.

Low to moderate rates of course utilization were observed for men in all vocational subject areas (Table 3-7). Skilled jobs CURs were less than 50 percent in all areas. In precision production, the largest vocational education area for men, the rate of skilled jobs course utilization was 27 percent in 1983 and 36 percent in 1985. In mechanics and repairers, the second largest vocational area among men, the skilled jobs CURs was significantly higher, 39 percent in 1983 and 46 percent in 1985.

In comparing rates of skilled job course utilization among men and women, three points stand out. First, as previously mentioned, overall course utilization is much higher for women than men. Second, course utilization among women tends to be highest in traditionally female subject areas: business, health, and occupational home economics, and lowest in traditionally male subject areas. Conversely, course utilization among men tends to be lowest in the traditionally female subject areas. Third, skilled jobs course utilization increases over time for both men and women.

Table 3-7

Rates of Vocational Course Utilization by Subject Area, Men

Vocational Subject	Percentage Share of all Specific Coursework	Skilled Jobs CUR		CUR	
		Fall 1983	Fall 1985	Fall 1983	Fall 1985
Agriculture	8.70	45.5	43.6	47.0	45.1
Business	6.09	30.1	32.4	42.5	46.7
Marketing	4.75	35.5	20.9	45.2	27.5
Health	0.51	11.8	7.5	11.8	9.9
Occupational Home Economics	2.00	21.3	14.4	27.3	18.9
Construction	12.01	34.0	42.0	34.0	42.0
Mechanics and Repairers	26.25	38.7	45.5	46.4	51.6
Precision Production	37.43	27.1	36.0	34.5	41.8
Transportation	0.22	32.1	6.2	32.6	6.2
Technical and Communications	2.04	18.3	22.1	20.1	22.4
All	100.00	32.6	38.0	39.0	43.2
Sample Size	702				

Source: High School and Beyond Sophomore Cohort.

The Causes of Course Underutilization

Although it would be unrealistic (and even undesirable) to expect percentage rates of course utilization to approach 100 percent,[49] the estimates reported in some fields are low enough to call

[49] Rates approaching 100 percent would leave no room for students to explore career alternatives.

into question the efficacy of occupationally specific training in some subject areas. Factors that may account for the underutilization of occupationally specific vocational training include:

- Voluntary nonplacement: students choose to work in occupations unrelated to their specific occupational training.
- Frictional nonplacement: students accept work in unrelated occupations because they are unable to find available training-related jobs.
- Enrollment nonconcentration (diversification): if students take some coursework in unrelated vocational subjects, part of their training will always remain unutilized.
- Aggregate supply and demand imbalance: if the number of students trained in a particular field or subject area exceeds the number of job openings (at the market wage), some students will be denied access to training-related jobs.
- Low-skill job incidence: jobs that require only minimal occupational skills provide no opportunity for utilization of job-related occupational skills.

Before presenting estimates of the relative importance of these five factors, the analysis identified the incidence of low, medium, and high skill jobs by occupational area.

To conduct this analysis, the detailed 1970 census occupations were grouped into 11 aggregate occupational areas, the first 10 of which were designed to parallel exactly the 10 vocational subject areas. For example, the first occupational area included all occupations related to agricultural training. The 11th area included all occupations that were not related to any of the 10 vocational subject areas. This classification scheme was developed to facilitate simple comparisons of the supply of students by vocational subject area and the demand for workers by occupational area.

This strategy is perfectly valid only if occupations are related to a single vocational subject area. In fact, the crosswalk that is used to relate vocational courses and occupations suggests that some occupations are related to vocational fields in more than one subject area. As a result, the simple procedure used here probably exaggerates the degree of supply and demand imbalance and, therefore, understates the level of voluntary and frictional nonplacement.

The incidence of low skill jobs in fall 1983 was relatively high, particularly for young women (Table 3-8). Thirty-four percent of all jobs held by women 16 months out of high school were in low-skill occupations, as compared with 22 percent for men. By the fall of 1985 (40 months out of high school), the incidence of low skill jobs had fallen dramatically for women, to 22 percent. The incidence of low skill jobs also declined for men, to 17 percent. For both men and women, the decline in low skill jobs was matched by growth in high skill jobs. In 1985, 38 percent of women and 44 percent of men worked in high skill occupations.

Table 3-8

The Incidence of Low, Medium, and High Skill Occupations

	Percentage of Women		Percentage of Men	
Skill Level	Fall 1983	Fall 1985	Fall 1983	Fall 1985
Low Skill	34.05	22.31	21.58	16.63
Medium Skill	39.78	39.39	43.69	38.99
High Skill	26.17	38.30	34.73	44.38
All	100.00	100.00	100.00	100.00
Sample Size	699	667	702	699

Source: High School and Beyond Sophomore Cohort.

The distribution of medium- and high-skilled jobs differed significantly, however, between men and women (Tables 3-9 and 3-10). A single occupational area dominated the skilled labor market for women, the area of business. In 1983, medium- and high-skill business occupations accounted for 24 percent of all jobs among the young women. By 1985, this figure had risen to 35 percent. In fact, virtually all of the growth in skilled jobs for women between 1983 and 1985 was due to the growth in skilled business jobs. In both 1983 and 1985, skilled jobs in marketing

Table 3-9

The Distribution of Jobs by Occupational Area and Skill Level, Women

Occupational Area	Percentage Medium Skill		Percentage High Skill		Percentage Medium and High Skill	
	Fall 1983	Fall 1985	Fall 1983	Fall 1985	Fall 1983	Fall 1985
Agriculture	0.98	0.81	0.25	0.25	1.23	1.06
Business	9.83	13.32	14.02	21.97	23.85	35.29
Marketing	11.05	7.74	1.33	1.93	12.38	9.67
Health	3.18	2.89	1.69	2.29	4.87	5.18
Occupational Home Economics	6.49	5.82	5.28	4.38	11.77	10.20
Construction	0.63	0.21	0.00	0.00	0.63	0.21
Mechanics and Repairers	1.15	0.43	0.71	1.14	1.86	1.57
Precision Production	6.22	7.74	1.42	1.84	7.64	9.58
Technical and Communications	0.00	0.00	0.97	4.14	0.97	4.14
Nonvocational	0.23	0.43	0.50	0.38	0.73	0.81
All Medium and High Skill	39.78	39.39	26.17	38.30	65.95	77.69
All Low Skill					34.05	22.31
All Occupations					100.00	100.00
Sample	699	667	699	667	669	667

Source: High School and Beyond Sophomore Cohort.

Table 3-10

The Distribution of Jobs by Occupational Area and Skill Level, Men

Occupational Area	Percentage Medium Skill		Percentage High Skill		Percentage Medium and High Skill	
	Fall 1983	Fall 1985	Fall 1983	Fall 1985	Fall 1983	Fall 1985
Agriculture	9.45	7.10	1.56	2.60	11.01	9.70
Business	5.26	5.96	5.23	8.50	10.49	14.46
Marketing	6.70	5.19	1.47	3.03	8.17	8.22
Health	0.23	0.23	0.26	0.27	0.49	0.50
Occupational Home Economics	1.04	1.64	5.69	2.60	6.73	4.24
Construction	6.86	5.89	3.22	5.86	10.08	11.75
Mechanics and Repairers	3.46	2.94	8.13	7.66	11.59	10.60
Precision Production	8.37	8.29	8.50	12.18	16.87	20.47
Technical and Communications	0.00	0.00	0.47	1.58	0.47	1.58
Nonvocational	2.32	1.75	0.19	0.10	2.51	1.85
All Medium and High Skill	43.69	38.99	34.73	44.38	78.42	83.37
All Low Skill					21.58	16.63
All Occupations					100.00	100.00
Sample	702	699	702	699	702	699

Source: High School and Beyond Sophomore Cohort.

accounted for 24 percent and occupational home economics 20 percent of all jobs among women. Precision production, health, and technical and communications accounted for most of the remaining jobs.

In sharp contrast to women, jobs for men were spread more evenly across all occupational areas although they were more concentrated in areas that accounted for few of the jobs held by women. Men's occupational areas included: agriculture (11 percent of skilled jobs in 1983), construction (10 percent in 1983), mechanics and repairers (12 percent in 1983), and precision production (17 percent in 1983). Business and marketing were important job areas for men as well as women. The two areas accounted for 10 and 8 percent, respectively, of all jobs among men in 1983.

In summary, among women, business dominated both the supply of occupationally specific training and the observed distribution of skilled jobs. Enrollments were generally low among women in nontraditional fields, fields that also accounted for the fewest jobs. Among men, enrollments tended to be highest in the following areas: agriculture, construction, mechanics and repairers, and precision production, areas that also accounted for a large share of jobs.

Despite this general consistency between the supply of workers and their job opportunities, close inspection of the supply and employment tables suggests that, for men, there appears to have been more enrollments relative to employment opportunities in precision production and mechanics and repairers and fewer enrollments than jobs in business and marketing for both 1983 and 1985. For women, relative to training, there appears to have been underemployment in health and possible overenrollment in business. The enrollment-job match is discussed below in the context of the factors that account for skill underutilization.

The following procedure was used to estimate the sources of course underutilization. First, the analysis simulated the operation of a labor market with near-perfect matching between workers with particular vocational skills and jobs with particular occupational requirements. The supply, by

vocational subject area, was assumed to be fixed and limited to a single age-cohort of workers. Since HS&B consists of a single-grade cohort, it was impossible to consider a more general model that would have allowed for substitution between skilled workers from adjacent cohorts. This limitation could bias the estimates if the distributions of supply and demand by occupational area were highly variable over time. In fact, however, the supply of high school graduates by vocational subject area has exhibited great year-to-year stability as demonstrated by the discussion of coursetaking patterns in the previous chapter. The analysis also assumed that the occupational demand for workers in the HS&B cohort was fixed. In practice, the demand for skilled workers could be affected by the difficulties and costs involved in recruiting qualified workers.

In the simulation, workers and jobs were matched according to the following rules. Workers were classified as fully qualified for a particular occupational area if they had taken at least 2 1/4 credits in their primary subject area in the related occupational area. Workers with fewer related credits were classified as minimally qualified and workers with no related credits were classified as nonqualified. Workers were assigned to jobs on the basis of their qualifications: fully qualified workers first, minimally qualified workers second, and nonqualified workers last. In occupational areas with an insufficient number of qualified workers, nonqualified workers were assigned in order to make up the difference between demand and qualified supply. In occupational areas with excess qualified supply, workers were randomly selected first from the pool of fully qualified workers and second from the pool of minimally qualified workers, if there were remaining vacancies.

This stage of the procedure yielded an estimate of the number of fully and minimally qualified workers placed within each occupational area, and an estimate of the associated skilled jobs course utilization rate, given the hypothetical assumption of near-perfect matching. The latter statistic tends to exceed the simulated placement rate because fully qualified placements (with their higher level of

credits) contribute more to the rate of course utilization than to the rate of placements. The following formula defines the estimated skilled jobs CUR given near-perfect matching.

$$\text{Simulated Skilled Jobs CUR} = \frac{\sum_j PFQ_j * CFQ_j + PMQ_j * CMQ_j}{\sum_j FQ_j * CFQ_j + MQ_j * CMQ_j},$$

where FQ_j and MQ_j equal the actual number of fully and minimally qualified workers (based on their primary vocational subject) in occupational area j, PFQ_j, and PMQ_j equal the simulated number of placed fully and minimally qualified workers in occupational area j, and CFQ_j and CMQ_j equal the average number of primary credits taken in subject area j by fully and minimally qualified workers, respectively. The degree of course underutilization due to supply and demand imbalance and the existence of low skill jobs is given by (1 - simulated skilled jobs CUR).

In the second stage of the procedure, the simulated skilled jobs CUR was compared with the actual CUR in order to derive the degree of underutilization that could be attributed to frictional and voluntary nonplacements, essentially a residual category. The latter statistic is implicitly defined by the following identity:

Actual Skilled Jobs CUR	=	Primary Course Concentration Rate	*	Simulated Skilled Jobs CUR given near-perfect matching of primary credits	*	Matching efficiency rate

where the degree of underutilization due to frictional and voluntary nonplacements is given by (1 - matching efficiency rate).

Finally, the degree of course underutilization due to supply and demand imbalance and the existence of low-skill jobs is apportioned separately to each of the two factors. The share apportioned to low-skill jobs is equal to the number of low-skill jobs divided by the sum of the number of low-

skill jobs plus the number of jobs that are filled with nonqualified workers (that is, the level of excess demand in skilled occupations). The share apportioned to supply and demand imbalance is equal to one minus the prior number.

Table 3-11 reports estimates of the contribution of voluntary and frictional nonplacement, enrollment nonconcentration, aggregate supply and demand imbalance, and low-skill job incidence to the rate of skilled jobs course utilization. It was impossible to distinguish between the first two factors, so they are combined into a single category. The two factors could in principle be distinguished given individual data on job search and job offers. As indicated above, the estimates in Table 3-8 indicate the multiplicative effects of the factors on the degree of course underutilization. The product of one minus each factor (expressed as a rate, not in percentage terms) equals the reported skilled jobs CUR. Thus, data for each factor (or factor combinations) indicate the amount of course underutilization that would occur from that factor if all other factors were eliminated as sources of underutilization.

The results in Table 3-11 are striking and perhaps surprising. They indicate that voluntary and frictional nonplacement was the major cause of course underutilization in 1983 and 1985, particularly among men. For men in 1983, the estimates indicate that even if enrollment nonconcentration, supply and demand imbalance, and low-skill job incidence had been eliminated, course underutilization would still have been great. That is, the skilled jobs CUR would have been only slightly higher than the actual skilled jobs CUR at that time. Unrelated placements were also large for women, and rose over time.

But low-skill job incidence, enrollment nonconcentration, and supply and demand imbalance also contributed to course underutilization, although the magnitude of these factors differed significantly for men and women and over time. For women, for example, low-skill jobs were a major reason for course underutilization in 1983 (21 percent), but a relatively modest reason by 1985

Table 3-11

Factors that Account for Underutilization of Occupationally Specific Vocational Education

Factor	Percentage of Women		Percentage of Men	
	Fall 1983	Fall 1985	Fall 1983	Fall 1985
Voluntary and frictional nonplacements[a]	25.35	31.53	44.24	37.89
Enrollment nonconcentration[a]	13.78	14.29	22.88	22.07
Aggregate supply and demand imbalance, and low-skill job incidence[a]	28.68	9.68	24.18	21.50
Aggregate supply and demand imbalance[b]	7.52	3.27	10.60	11.41
Low-skill job incidence[b]	21.16	6.41	13.58	10.09
Skilled jobs CUR	45.9	53.0	32.6	38.0

[a] The factor aggregates in rows 1, 2, and 3 interact in the determination of the skilled jobs CUR. The product of one minus each factor (÷ 100) equals the skilled jobs CUR. See text for further discussion.

[b] The aggregate factor in row 3 is the sum of the factors in rows 4 and 5.

Source: High School and Beyond Sophomore Cohort.

(6 percent). For men, enrollment nonconcentration (not taking a coherent group of courses) was a consistently large source of course underutilization (23 percent in 1983). For men and women, the least important source of course underutilization was aggregate match of training supply and available jobs.

Diagnosis of the sources of course underutilization leads to the following conclusions. First, the fact that voluntary and frictional nonplacements appear to have been so pervasive indicates that schools and employers need to do a much better job of placement--helping students get skilled,

training-related jobs.[50] If this proves to be an impossible task, then policymakers in vocational education need to assess carefully the degree to occupationally specific training should be provided, as opposed to more general occupational preparation.

Second, the fact that voluntary and frictional nonplacements are so large indicates that many students may enroll in occupationally specific training without a strong commitment to use their training in subsequent employment. It is likely that these students are not yet ready to select a specific area of skill specialization. These students should have had additional vocational options from which to choose or have postponed decision making altogether. Ideally, students who are ready to select a specific area of skill specialization should have access to high quality occupationally specific training coupled with aggressive job placement assistance. Students who are not yet ready to specialize should have access to equally high-quality broad occupational and general vocational education. The general point is that secondary vocational education needs to provide an array of curriculum options that reflect the diverse needs and interests of its clientele.

Third, schools need to take steps to accelerate the placement of high school youth into skill-demanding occupations. Although this analysis did not identify the factors that accounted for the initial high incidence of low-skill jobs, particularly among women, students would probably be much more likely to obtain skill-demanding jobs if they had strong academic and occupational skills. Furthermore, it seems likely that students would be stimulated to work harder and learn more if they faced the prospect of obtaining jobs that made full use of their academic and vocational skills right out of high school. If so, schools should approach the challenge of raising the skill levels of youth jobs by: (1) improving the academic and vocational rigor of vocational education; (2) ensuring that

---

[50] Since it is estimated that voluntary and frictional nonplacements combined were a major source of course underutilization, it is likely that both factors were important. Alternatively, either one of the factors could have been responsible for most or all of the observed combined effect. For policy purposes, it is probably prudent to assume that both factors were important.

all high school students, even those ready to select an occupational specialty, develop strong academic skills; (3) working with employers to place adequately prepared students in skilled jobs; and (4) designing vocational programs to meet the needs of skill-demanding employers.

Finally, since enrollment in vocational courses unrelated to each other (nonconcentration) was an important source of course underutilization, particularly for men, schools need to ensure that students enroll in coherent sequences of occupationally specific training--courses that are consistent with one another. Students who are not yet ready to select a specific area of skill specialization may be better off enrolling in high-quality broad and general vocational training, rather than enrolling in a variety of unconnected occupationally specific courses. On the other hand, exposure to a variety of different occupational courses may help students develop or clarify their occupational interests and talents. Schools may need to experiment with alternative mechanisms for accomplishing career exploration.

In summary, the evidence indicates that in order for occupationally specific training to remain viable at the secondary level, much greater emphasis needs to be given to placing students in training-related jobs. The range of curriculum options in secondary vocational education needs to be expanded to accommodate both students who are and are not ready to select a specific area of occupational specialization. To do so, vocational education will need new courses and programs that provide instruction in broad occupational skills that cut across a wide array of occupations. This objective may be particularly important for training in occupations that account for only modest shares of employment. This objective is also important because the findings presented here on the underutilization of training are only for those students who obtained no further education beyond high school. In fact, the majority of secondary vocational education is taken by students who enroll in some form of postsecondary education. Finally, secondary vocational education must recognize that high school students need a firm grounding in both academic and occupational skills.

It is recommended that in future analyses the "skilled jobs course utilization rate" be substituted for other measures of the relatedness of jobs to vocational training. First, the traditional training-related placement rate (TRPR) has several major weaknesses, as noted earlier. In addition, the TRPR does not allow for the possibility that students make use of vocational skills learned in courses outside their major vocational area.

While a course utilization rate of any type would overcome these problems, there remains one additional and major concern. A simple course utilization measure fails to distinguish jobs that require sophisticated skills from jobs that require few or no skills. As a result, students may have high course utilization rates but be employed in jobs that offer no opportunities to use the actual job skills they learned in school. Vocational administrators could decide to expand training in a field that presented few opportunities for skilled jobs because the simple course utilization rate in that field is high. Only the skilled jobs CUR, or an indicator like it, can overcome this major weakness.

REFERENCES

Brown, Cynthia, E. Gareth Hoachlander, and Robert H. Meyer. 1989. "The Secondary School Course Taxonomy," National Assessment of Vocational Education Report, U.S. Department of Education.

Campbell, Paul B. et al. 1986. "Outcomes of Vocational Education for Women, Minorities, The Handicapped, and the Poor", Columbus: The National Center for Research in Vocational Education, the Ohio State University.

Educational Commission of the States. 1987. "State High School Minimum Graduation Requirements," Denver, CO

Gifford, A. G., D. Harde, E. G. Hoachlander, R. H. Meyer, and J. E. Tuma. 1989. "Course Enrollment Patterns in Secondary Schools: 1975 to 1987," National Assessment of Vocational Education Report, U.S. Department of Education.

Hayward, Becky J. and John G. Wirt. 1989. *Handicapped and Disadvantaged Students: Access to Quality Vocational Education*, NAVE Final Report, Volume V. Washington, DC: U.S. Department of Education.

Horn, Robin S. and Robert H. Meyer. 1990. "Using the New Vocational Indicators: A Guide to Data Preparation," Mimeograph, Economics Department, University of Wisconsin at Madison.

MPR Associates. 1986. *Classifications of Secondary Vocational Education Courses and Students*, Draft document prepared for National Center for Education Statistics.

National Commission on Excellence in Education. 1983. *A Nation At Risk*. Washington, DC: U.S. Department of Education.

National Science Board Commission on Pre College Education in Mathematics, Science, and Technology. 1983. *Educating Americans for the 21st Century*. Washington, DC: National Science Board/National Science Foundation.

Swartz, Janet. 1989. *State and Local Response to the Carl D. Perkins Act, Survey Analysis Final Report*. Cambridge MA: Abt Associates.

Tuma, John and Antoinette Gifford. n.d. "Higher Graduation Standards and Their Effects on Coursetaking Patterns of College and Noncollege-Bound High School Graduates," Berkeley, CA: MPR Associates.

Tuma, John, Antoinette Gifford, Laura Horn, E. Gareth Hoachlander. 1989. "Enrollment Trends in Vocational and Academic Education in American Public High Schools, 1969-1987," Berle;eu. CA: MPR Associates.

U.S. Department of Labor. 1962. *Handbook for Analyzing Jobs*. Washington, D.C.

ED/OPP93-36

© U.S. GOVERNMENT PRINTING OFFICE: 1993 - 358-341 - 814/90192